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**MASTER OF SURGERY (MS)**

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# COMPREHENSIVE ANALYSIS OF "ABDOMINAL TUBERCULOSIS IN SUBACUTE INTESTINAL OBSTRUCTION"


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**Dr. Santosh Kumar Sahnai**

# *INTRODUCTION*

# INTRODUCTION

Tuberculosis (TB) remains one of the oldest and most persistent diseases affecting humanity. Despite the availability of effective anti-tubercular medications and the implementation of control programs, TB continues to pose a significant public health challenge, particularly in underdeveloped and developing nations such as India. Each year, the disease accounts for approximately 7 million new cases and 2.5 million deaths globally, ranking it among the top ten leading causes of mortality. When occurring alongside HIV/AIDS, TB is often referred to as part of the "deadly duo" due to the compounded health burden they impose.[1]

The COVID-19 pandemic has had a detrimental impact on global tuberculosis (TB) control efforts, highlighting the need for renewed focus on early diagnosis and treatment. Microbiology laboratories are essential for the rapid and accurate detection of tuberculosis and drug resistance, which are public health priorities. According to the latest WHO report, the pandemic severely disrupted tuberculosis diagnostic services, leading to a notable decline in the number of people diagnosed and treated.[1,2]

In 2020, there was an 18% reduction in tuberculosis diagnoses globally compared to the previous year, with countries such as India, Indonesia, and the Philippines seeing the sharpest drops. Although there was a partial recovery in 2021, the interruption caused by COVID-19 has resulted in an increase in untreated cases, which may lead to higher mortality rates and the spread of infection within communities. Between 2019 and 2021, the number of deaths from tuberculosis rose significantly, reversing the progress that had been made in previous years to reduce TB-related mortality. This underscores the urgent need to restore and strengthen TB control measures post-pandemic. [1,2]

The disease may involve any system of the body but abdomen is one of the commonest site of involvement after lungs.[1]

Abdominal Tuberculosis is the sixth most common form of extra-pulmonary Tuberculosis after lymphatic, genitourinary, bone and joints, miliary and meningeal Tuberculosis.[3]

Relative to pulmonary tuberculosis, extra-pulmonary tuberculosis, particularly gastrointestinal tuberculosis, is a neglected problem. The clinical presentation of patients with intestinal TB and post-TB intestinal obstruction is non-specific.

It can be acute, chronic, or acute on chronic. The presentation can range from mere abdominal pain to features of peritonitis or intestinal obstruction. This makes clinical diagnosis very difficult. Preoperative diagnosis of intestinal tuberculosis is challenging, particularly in resource-limited settings.

Severe complications of gastrointestinal Tuberculosis include intestinal strictures, obstruction, perforation and bleeding. Intestinal obstruction is the leading complication of intestinal Tuberculosis, and it occurs because of intestinal luminal narrowing, multiple strictures or adhesions. Intestinal obstruction secondary to intestinal Tuberculosis is an uncommon cause of mechanical obstruction.[3]

Though potentially curable, abdominal Tuberculosis continues to be a major cause of morbidity and mortality. In the abdomen, Tuberculosis may affect the gastro-intestinal tract, peritoneum, lymph nodes, and solid viscera.

Intestinal Tuberculosis has usually one of the three main forms i.e. ulcerative, hypertrophic or ulcerohypertrophic, and fibrous stricturing form.[4]

The clinical presentation depends upon the site and type of involvement. It usually runs an indolent course and presents late with complications especially acute or subacute intestinal obstruction due to mass (tuberculoma) or stricture formation in small gut and ileocaecal region or gut perforation leading to peritonitis.[5]

This study is carried out to find out the prevalence of Intestinal Tuberculosis in cases of Subacute Intestinal Obstruction, presenting as intestinal obstruction/peritonitis. We can minimize these fatal complications by early diagnosis and timely treatment of the cases.

# *AIM AND OBJECTIVES*

# AIM AND OBJECTIVES

## Aim:

The aim of this study is to determine the prevalence of intestinal tuberculosis in patients with subacute intestinal obstruction (SAIO) and establish a correlation between the two conditions. It seeks to enhance early diagnosis, improve clinical management, and reduce complications through better understanding of the disease presentation and diagnostic challenges.

## Objective

1. To find out the association of Abdominal Tuberculosis in Subacute Intestinal Obstruction patients.
2. To find out the clinical characteristics of Subacute Intestinal Obstruction patients.
3. To find out the clinical characteristics of Tubercular Abdomen Patients.
4. To study the various clinicopathological manifestations of Abdominal Tuberculosis.

# *REVIEW OF LITERATURE*

# REVIEW OF LITERATURE

Historical records reveal that Tuberculosis had been recognized as a disease from the earliest time, and Hippocrates in the 4th century BC bestowed the name phthisis, meaning wasting, upon the disease as it affected the lungs.

In the 5th century BC, Hippocrates recorded that diarrhoea in a person with phthisis was a mortal symptom. This is probably the first recorded connection between gastrointestinal symptoms and Tuberculosis. In 1643, probable intestinal Tuberculosis was diagnosed in the autopsy of Louis XIII which showed ulcerative intestinal lesions in association with large pulmonary cavity. John Hunter, described the microscopic tubercle " in the liver, the spleen, the uterus, the coats of the intestines, the peritoneum".

He postulated that these tubercles probably arose from the lungs. This was followed by the description of a tubercle causing an ulcer in the mucous membrane of the intestine resulting in destruction of the wall and leading to intestinal phthisis.

John Hunter then goes on to describe the clinical features of abdominal tuberculosis. 'I have seen the whole of the intestine adhering to the peritoneum seemingly from a scrofulous cause, and having scrofulous tumours and suppurations in them also; the symptoms were tightness of the belly without pain, and costiveness; at other times, purging'.

During the 18th and 19th centuries, abdominal Tuberculosis was probably as common as pulmonary Tuberculosis and other types of the disease.

In 1828, John Abercrombie from Edinburgh gives a very lucid description of 17 chronic peritonitis, which is clearly identifiable with tuberculous peritonitis. He explains the disease as “occurring in young person as an insidious affection of utmost danger yet extremely obscure in its symptoms”.

In 1882 Robert Koch discovered the Tubercle bacilli, in the same year Ziel used carbolic acid to demonstrate the Acid Fastness of the bacilli. In 1883 Nielson replaced nitric acid by 25% sulphuric acid.

Even at the beginning of this century, reports of ileocaecal Tuberculosis without lung involvement were common. In 1902 Mayo Robson, a surgeon at Leeds, presented a paper at the Clinical Society of London on the surgical treatment of chronic intestinal Tuberculosis.

In the 1920's surgeons were beginning to realise that there were lesions other than abdominal Tuberculosis that could cause thickening and narrowing of the small intestine. Matthew Stewart commented that 'whether there is such a thing as a hyperplastic enterocolitis of non-tuberculous origin still remains to be seen.

During the second half of the 19th century, surgeons were beginning to operate on the abdomen and abdominal Tuberculosis. The etiology of abdominal Tuberculosis leading to subacute intestinal obstruction involves Mycobacterium Tuberculosis, the bacterium responsible for causing Tuberculosis.

When M. Tuberculosis infects the abdominal organs, it can result in various manifestations, one of which is subacute intestinal obstruction.

The infection often occurs through the respiratory route, where the bacteria are inhaled and primarily affect the lungs. However, in some cases, M. Tuberculosis can spread through the lymphatic or hematogenous route to other parts of the body, including the abdominal cavity.

During the second half of the 19th century, surgeons were beginning to operate on the abdomen and abdominal tuberculosis is reported to have been most commonly found after malignant and acute inflammatory conditions.

At the beginning of the 20th century, it had become customary to describe three forms of abdominal tuberculosis:

1) Ulcerative tuberculosis or tuberculous enteritis;

2) Tuberculous peritonitis;

3) Hyperplastic tuberculosis.

The exact mechanism of how M. Tuberculosis causes abdominal Tuberculosis and subsequent subacute intestinal obstruction is not fully understood. However, it is believed that the bacteria can reach the abdominal organs through the lymphatic system, bloodstream, or by direct extension from adjacent infected structures. The infection may initially affect the peritoneum leading to peritoneal Tuberculosis, which can later involve the intestines, resulting in subacute intestinal obstruction.

Various factors can contribute to the development of abdominal Tuberculosis leading to subacute intestinal obstruction.[3]

## Epidemiology:

Estimated epidemiological burden of tuberculosis in 2017[6]

| Region | Population (× 1 million) | TB mortality, best estimate (× 1000) | | TB incidence, best estimate (× 1000) | | MDR/RR-TB incidence (× 1000) |
|---|---|---|---|---|---|---|
| | | HIV-negative | HIV-positive | Overall | HIV-positive | |
| High TB * | 4760 | 1110 | 247 | 8720 | 766 | |
| Africa | 1047 | 413 | 252 | 2480 | 663 | 90 |
| Americas | 1006 | 18 | 6 | 282 | 30 | 11 |
| Eastern Mediterranen | 682 | 89 | 3 | 771 | 9.8 | 41 |
| Europe | 920 | 24 | 5 | 273 | 33 | 109 |
| South-East Asia | 1968 | 638 | 28 | 4440 | 152 | 192 |
| Western Pacific | 1901 | 92 | 5 | 1800 | 31 | 114 |
| *Global* | 7523 | 1270 | 300 | 10000 | 920 | 558 |

**WHO 2018 global tuberculosis report**

- TB occurs in every part of the world. In 2017, the largest number of new TB cases occurred in the South-East Asia and Western Pacific regions, with 62% of new cases, followed by the African region, with 25% of new cases.
- There were cases in all countries and age groups, but overall 90% of the patients were adults (aged ≥ 15 years) and 9% were people living with HIV (72% of them in Africa).
- In 2017, 87% of new TB cases occurred in the 30 countries with a high TB burden, and two-thirds were in eight countries: India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%), and South Africa (3%).
- Only 6% of global cases were in the WHO European Region (3%) and WHO Region of the Americas (3%).
- The severity of national epidemics varies widely among countries. In 2017, there were fewer than 10 new cases per 100,000 population in most high-income countries, 150–400 in most of the 30 countries with a high TB burden, and above 500 in a few countries, including Mozambique, the Philippines, and South Africa.
- Drug-resistant TB continues to be a public health crisis. Three countries accounted for almost half of the world's cases of multidrug-resistant/rifampicin-resistant (MDR/RR) TB: India (24%), China (13%), and the Russian Federation (10%).
- Globally, 3.5% of new TB patients and 18% of previously treated patients had MDR/RRTB. The highest proportions (> 50% in previously treated patients) are in countries of the former Soviet Union. Among patients with MDR-TB in 2017, 8.5% (95% confidence interval, 6.2% to 11%) were estimated to have extensively drug-resistant TB (XDR-TB).

- The geography of the disease is changing, in Western countries mainly due to immigration, HIV, and the development of multidrug-resistant strains of TB [8].
- In some Western countries, abdominal TB is mostly “imported” rather than “homegrown” TB.

The European Crohn’s and Colitis Organization (ECCO) guidelines point out that just spending time in a country with a high incidence of TB also raises individuals’ risk.[7]

## Etiology:

Tuberculosis is caused by Mycobacterium tuberculosis, a large, rod-shaped, non-motile obligate aerobe. Many nonpathogenic mycobacteria are part of the normal flora in humans, particularly in dry, oily areas of the body. These rod-shaped bacteria typically measure 2-4 μm in length and 0.2-0.5 μm in width.

In typical cases, Mycobacterium tuberculosis (MTB) complexes are primarily located in the well-aerated upper lobes of the lungs, as the bacterium is an obligate aerobe. The virulence of Mycobacterium tuberculosis is further enhanced by its ability to act as a facultative intracellular parasite, usually residing within macrophages, and by its slow generation time of 15-20 hours. Two types of media are commonly used to culture Mycobacterium tuberculosis: agar-based Middle brook medium and egg-based Lowenstein-Jensen medium. On both media, Mycobacterium tuberculosis colonies appear small and buff-colored, with inhibitors included to prevent contamination. Colonies usually develop after 4 to 6 weeks.

Robert Koch was the first to observe "serpentine cords"—chains of cells grown from in vitro colonies—and he linked this cord factor to the virulent strains of Mycobacterium tuberculosis (MTB). Mycobacterium tuberculosis stains weakly as Gram-positive or sometimes not at all, resulting in what are referred to as "ghost" cells. The cell wall of Mycobacterium tuberculosis consists primarily of peptidoglycan (murein) and lacks the chemical properties characteristic of both Gram-positive and Gram-negative bacteria, so it cannot be classified under either category.

Mycobacterium species, along with the related genus Nocardia, are classified as acid-fast bacteria due to their resistance to certain dyes and stains. Once stained, acid-fast

bacteria retain the dye even after treatment with acidic organic compounds. The Ziehl-Neelsen stain is a common acid-fast staining method for detecting Mycobacterium tuberculosis. In this process, a smear is fixed, stained with carbol-fuchsin (a pink dye), decolorized with acid-alcohol, and then counterstained with methylene blue or other dyes. Acid-fast bacilli appear pink against a contrasting background.[8] [9]

To detect Mycobacterium tuberculosis in a sputum sample, at least 10,000 organisms per milliliter of sputum are needed for visualization using a 100x microscope objective (1,000x magnification). Even detecting one acid-fast bacillus per slide is considered "suspicious" of an Mycobacterium tuberculosis infection. [9]

## ABDOMINAL TUBERCULOSIS

Tuberculosis is a major public health problem in India, with more than 1 million tuberculosis cases reported.

As per the World Health Organization (WHO) global TB report of 2018, India tops the list of countries with reported tuberculosis cases.

Abdominal tuberculosis refers to Mycobacterial infection of any organ in the abdominal cavity, including the intestine & peritoneum. It is the sixth most common form of Extrapulmonary tuberculosis, constituting ~3% of all Extrapulmonary tuberculosis cases globally, and 11-13% of cases in India. Like pulmonary tuberculosis, it is common in the younger age group (25-44 years). It has varied presentations based on the site of involvement, stage of illness and complications, and poses a vast diagnostic challenge.[10]

Abdominal tuberculosis constitutes 11-13% of Extrapulmonary tuberculosis in India. It poses a diagnostic challenge because it presents with a myriad of manifestations.

Intestinal tuberculosis is the most commonly encountered sub-type, followed by peritoneal and lymph node tuberculosis.

Abdominal tuberculosis comprises of tuberculosis of gastrointestinal tract, peritoneum, omentum, mesentery, and its lymph nodes and other abdominal organs such as liver, spleen, and pancreas.

We need to have a high index of suspicion to diagnose abdominal tuberculosis as it mimics other common abdominal diseases.

Failure to suspect and diagnose abdominal tuberculosis can lead to high morbidity and mortality.[11]

Abdominal tuberculosis is a common form of extrapulmonary tuberculosis constituting 11% of the cases; Ileocaecal region is the most commonly affected area followed by ascending colon, jejunum, appendix, duodenum, stomach, esophagus, sigmoid colon, and rectum.

In 2017, 10 million people developed tuberculosis disease and 1.6 million died of it, including 0.3 million among people with HIV—TB is the leading killer of HIV-positive people.[12]

- About one-quarter of the world's population have latent tuberculosis.
- People infected with TB bacteria have a 5–15% lifetime risk of falling ill with tuberculosis. However, persons with compromised immune systems, such as people living with HIV, malnutrition, diabetes, those taking immunosuppressive drugs, and people who use tobacco, have a much higher risk of falling ill.
- Multidrug-resistant TB (MDR-TB) continues to be a public health issue and a health security threat. The World Health Organization (WHO) estimates that there were 558,000 new patients with resistance to rifampicin—the most effective first-line drug— among whom 82% had MDR-TB.
- Globally, the incidence of TB is falling at about 2% per year.
- An estimated 60 million lives were saved through tuberculosis diagnosis and treatment between 2000 and 2019

Abdominal tuberculosis is uncommon in comparison with pulmonary tuberculosis. Gastrointestinal tuberculosis makes up 2.5% of extrapulmonary cases in the United State.[13]

- Lymph-node disease is the most common presentation of extrapulmonary tuberculosis (EPTB), both in individuals with HIV infection and HIV-seronegative patients.

- Pleural tuberculosis accounts for approximately 20% of all extrapulmonary tuberculosis cases.
- Genitourinary tuberculosis accounts for 10–15% of all cases of extrapulmonary tuberculosis in the U.S.

Early diagnosis remains difficult, due to the nonspecific clinical presentation of tuberculosis, which can mimic other gastrointestinal diseases and may vary from an acute to a chronic abdomen in areas endemic for tuberculosis. While some may benefit from antitubercular therapy, others may develop surgical problems such as strictures, obstruction, fistulas, or perforations, which may necessitate surgical intervention.

## ETIOLOGY AND RISK FACTORS:

Tuberculosis flourishes wherever there is poverty and overcrowding.

Abdominal tuberculosis probably occurs due to reactivation of a dormant focus. This primary gastrointestinal focus is established as a result of haematogenous spread from a pulmonary focus acquired during primary infection in childhood. It may also be caused by swallowed bacilli which pass through the Peyer's patches of the intestinal mucosa and are transported by macrophages through the lymphatics to the mesenteric lymph nodes, where they remain dormant.[14]

The most common site of involvement is the ileocaecal region, possibly because of the increased physiological stasis, increased rate of fluid and electrolyte absorption, minimal digestive activity and an abundance of lymphoid tissue at this site. It has been shown that the M cells associated with Peyer's patches can phagocytise BCG bacilli.[15]

Primary abdominal tuberculosis is when infection occurs through ingestion of milk or food infected with Mycobacterium bovis. Primary abdominal tuberculosis is rare nowadays.

Secondary abdominal tuberculosis is due to tubercular focus elsewhere in the body, and it is acquired in the following ways:

- Dissemination of primary pulmonary tuberculosis

- Swallowing of infected sputum
- Hematogenous dissemination
- Spread from infected adjacent organs like fallopian tubes
- Lymphatic spread from infected mesenteric lymph nodes Predisposing Factors for Intestinal Tuberculosis
- Rich in lymphoid tissue: Peyer's patches and lymph nodes
- AFB affinity for lymphoid tissue
- Number of bacilli ingested
- Virulence of bacilli
- Nutritional and immunological status
- Alkaline pH in the small and large intestine4
- Stasis in the ileocecal area (Ileal break)
- More of water absorption and no digestive activity

The probability of developing tuberculosis disease is much higher among people affected by risk factors.

- People infected with HIV
- Other causes of immunosuppression—corticosteroid therapy, immunosuppressive or chemotherapeutic treatment, following treatment with anti-tumor necrosis factor (TNF) agents or other biological treatment, and patients undergoing continuous ambulatory peritoneal dialysis.
- Chronic debilitating diseases—diabetes mellitus, hematological diseases, and chronic lung disease, particularly silicosis.
- Malnutrition, underlying malignancy, cirrhosis, alcoholism.
- Elderly patients.
- Incarcerated and institutionalized individuals at risk of tuberculosis.
- Traveling to countries with a high incidence of tuberculosis.

Abdominal tuberculosis denotes involvement of the gastrointestinal tract, peritoneum, lymph nodes, and solid viscera, e.g. liver, spleen, pancreas, etc. The ileum and cecum are the most common sites of intestinal involvement and are affected in 75% of cases. Both sides of the ileocecal valve usually are involved, leading to incompetence of the

valve, a finding that helps distinguish tuberculosis from Crohn's disease. Other locations of involvement, in order of descending frequency, are the ascending colon, jejunum, appendix, duodenum, stomach, oesophagus, sigmoid colon, and rectum. Multiple areas of the bowel can be affected.[16]

Three types of intestinal lesions are commonly seen - ulcerative, stricturous, and hypertrophic, cicatricial healing of the ulcerative lesions resulting in strictures. Occlusive arterial changes may produce ischemia and contribute to development of strictures. These morphological types can coexist, e.g., ulcero-constrictive and ulcero-hypertrophic lesions. Small intestinal lesions are usually ulcerative or stricturous and large intestinal lesions are ulcero-hypertrophic. Colonic lesions are usually associated with ileocaecal or ileal involvement.

Peritoneal involvement may be of either an ascitic or adhesive (plastic) type. The lymph nodes in the small bowel mesentery and the retro peritoneum are commonly involved, and these may caseate and calcify. Disseminated abdominal tuberculosis involving the gastrointestinal tract, peritoneum, lymph nodes and solid viscera has also been described.[15]

## PATHOGENESIS:

**Route of infection:**

There are four possible routes of infection involving the gastrointestinal tract (GIT):

- Per oral (via ingestion)
- Hematogenous (through the bloodstream)
- Lymphatic (through the lymphatic system)
- Spread from a contiguously involved organ (direct extension from adjacent infected tissues)

**Mode of infection:**

**The Primary Complex:**

The initial infection occurs when an individual is exposed to the pathogen, either through inhalation of droplets or consumption of contaminated food. The infection then spreads to the regional lymph nodes, leading to the development of Tubercular

Lymphadenitis, also known as the Primary Complex. Depending on the host's immune response, the infection may either resolve on its own or progress into Miliary Tuberculosis.

**The Post-Primary Complex:**

Unresolved Primary Complex, progress to post-Primary infection, e.g. Hyperplastic ileocaecal tuberculosis.

**Reinfection or the Secondary Complex:**

Reinfection in a patient who has recovered from the primary disease results in the formation of a secondary complex, such as ulcero-constrictive lesions of the intestine. Intestinal tuberculosis is primarily transmitted through the ingestion of infected sputum from individuals with active pulmonary tuberculosis; however, other modes of transmission, as previously mentioned, are also noteworthy. The bacilli are able to pass through the gastric acid barrier unharmed due to their resistant fatty coat, primarily composed of mycolic acid.

Ileocaecal region is the common site of involvement because

The ileocaecal region is the most commonly involved site in intestinal tuberculosis due to several factors:

- The pH of the chyme in the terminal ileum is alkaline, which favors the growth of the organism.
- By the time food and sputum reach the ileum, they have been thoroughly digested, allowing the bacilli to be liberated.
- The prolonged contact between the ileal contents and the mucosa increases the likelihood of implantation.
- A substantial number of aggregated lymphatic follicles, known as Peyer's patches, provide a conducive environment for the organism's growth.

Typically, the organism becomes trapped in mucosal lymphoid aggregates, subsequently entering the crypts of Lieberkühn. It is then transported into the submucosa by phagocytes, where characteristic inflammatory changes occur. The resultant enteritis reduces the blood supply to the overlying mucosa, leading to

necrosis and subsequent sloughing, which forms the typical ulcer with undermined edges. Inflammation may extend to varying depths, with the base of the ulcer consisting of the submucosa, muscularis, or serosa. Due to the gradual evolution of the ulcer, fibrosis can develop rapidly, resulting in early adhesion formation. The circumferential spread of inflammation often leads to stricture formation.

The most significant inflammation occurs in the submucosa, resulting in marked thickening due to edema, cellular infiltration, lymphatic hyperplasia, tubercle formation, and fibrosis. The serosal layer may be affected through lymphatic spread or direct extension of the infection. This can subsequently lead to the spread of infection to the mesenteric lymph nodes, resulting in caseation and, ultimately, calcification.

The type of inflammatory process depends on the immunological reaction of the host and the virulence of the bacilli so,

- The Hyper plastic type is due to good host immunity and scanty population of bacteria with low virulence resulting in marked fibrosis and granulomatous reaction.
- The Ulcerative type is due to low host immunity and high population of bacilli with high virulence.

## PATHOLOGY

**Macroscopic changes:**

The active lesions are of two types - ulcerative and hypertrophic types.

**The ulcerative type**

The affected segment exhibits moderate induration, with nodules of varying sizes distributed around its circumference. An increase in mesenteric fat is noted, along with caseated, enlarged mesenteric lymph nodes, which are characteristic of the condition.

Single or multiple ulcers may be present; in the case of multiple ulcers, segments of normal mucosa of varying lengths can be observed between the diseased areas. A typical ulcer is oriented transversely. In classical presentations, an annular ulcer less than 3 cm in size can be observed in well-developed lesions that involve the full

circumference of the affected segment. This results in luminal narrowing, forming the characteristic "napkin ring" appearance. [9,15,17–19]

Ulceration typically does not penetrate the muscularis propria and is relatively superficial, presenting with a varied appearance. The ulcer bed is coarse and granular, often covered with a necrotic slough that may display small pseudopolyps. The mucosal folds may exhibit irregular erosions or may become flattened, sometimes mimicking a mamillated surface.

In well-defined ulcers, the margins can be undermined, sloping, or flush with the surface. In rare instances, ulcers may have a stellate appearance, characterized by deep excavation and intensely hyperemic mucosal shelves. In this type, adjacent mucosal folds converge toward the ulcer, aligning along the longitudinal axis. The wall underlying the ulcer bed can vary in thickness, being either thin or hypertrophic and may be scarred with yellowish areas of necrosis.

**Hypertrophic type:**

The ileocaecal region is commonly affected in the hypertrophic type of intestinal tuberculosis. In this condition, mesenteric fat and lymph nodes become extensively adherent, forming a substantial mass in the right iliac fossa, accompanied by a distorted and obtuse ileocaecal angle. The thickness of the intestinal wall can increase to up to 3 cm, resulting in a tubular appearance.

Mucosal changes can vary, presenting as prominent "cobblestoning," pseudopolyposis, or flattened mucosal folds with irregular furrows on the surface that converge at the site of constriction. [8,15,17,18]

It is important to note that there are no distinct differences between the two varieties, and coexistence of these types is often observed.

**Microscopic changes:**

In the hypertrophic type of intestinal tuberculosis, the mass is primarily composed of granulomatous tissue that extends to the serosa, along with enlargement of lymph nodes, increased mesenteric fat, muscularis hypertrophy, and fibrosis. Caseating granulomas are a key diagnostic feature of this condition. These granulomas typically first appear on the mucosa or within Peyer’s patches.

Structure of Granuloma:

Granulomas can be substantial in size, with their dimensions potentially increasing over time due to the enlargement of the initial focus or the confluence of multiple satellite granulomas. Each granuloma comprises a central and a peripheral region. The peripheral area is infiltrated with plasma cells, Langhans-type giant cells, and lymphocytes. Granulomas are frequently located in the immediate lining of the ulcer bed.

Ulcers are lined with inflammatory granulation tissue that is non-specific and typically does not penetrate the muscularis. In contrast, infiltrated polymorphonuclear leukocytes may extend into the submucosa, forming microabscesses. In chronic, longstanding cases, fibrosis of varying degrees occurs within lesions, extending from the submucosa into the muscularis. Well-developed granulomas can be observed in the walls of adjacent areas, with a gradual transition between the affected and unaffected tissues.

Well formed lesions show reparative changes.Pyloric gland metaplasia is most common, extensive and often seen in cases presenting with active inflammation.[20]

**CLASSIFICATION OF ABDOMINAL TUBERCULOSIS:**

PERITONEAL TUBERCULOSIS – Acute or Chronic

**1) Tuberculosis of the Peritoneum**

- Wet (Ascitic) Type: This can manifest as either a generalized or localized.
- Dry (Fibrous) Type: This includes adhesive, plastic, miliary, and nodular forms.

**2) Tuberculosis of Peritoneal Folds and Their Contents**

- Mesenteric Adenitis
- Mesenteric Cysts
- Mesenteric Abscess
- Bowel Adhesions
- Rolled-up Omentum
- GASTROINTESTINAL TUBERCULOSIS-
- Ulcerative
- Hyperplastic
- Ulcero-Hyperplastic

TUBERCULOSIS OF SOLID ORGANS- liver, spleen, pancreas

## CLINICAL FEATURES:

| Site | Type | Clinical features |
|---|---|---|
| **Small intestine** | Ulcerative | Diarrhea, malabsorption |
| | Stricturous | Obstruction |
| **Large intestine** | Ulcerative, Rectal bleeding | Rectal bleeding |
| | Hypertrophic | Lump obstruction |
| **Peritoneal** | Ascitic | Pain, distension |
| | Adhesive | Obstruction, fever, systemic symptoms of TB infection |
| **Lymph nodes** | | Lump, abdominal pain, fever, systemic symptoms |
| **Liver** | | Fever, malaise, weight loss, jaundice, abdominal pain and hepatomegaly |
| **Pancreas** | | Epigastric pain, fever and weight loss, jaundice, gastrointestinal bleeding |

**Bhansali**[20] observed frank malabsorption in approximately 21% of patients with abdominal tuberculosis, while **Tandon et al**.[21] reported that 75% of patients with intestinal obstruction exhibited biochemical evidence of malabsorption, compared to 40% of those without obstruction. The mass in patients with abdominal tuberculosis is typically firm, mobile, and only slightly tender. Rectal bleeding occurs in 4%[22] to 6%[23] of patients, though massive lower gastrointestinal bleeding is rare.[24]

Subacute intestinal obstruction presents with symptoms such as colicky abdominal pain, distension, vomiting, gurgling sounds, and the sensation of a "ball of wind" moving in the abdomen. These symptoms are often relieved spontaneously after the passage of flatus.

Ano-rectal tuberculosis can manifest as stricture,[25] fistula-in-ano,[5,26] or fissure-in-ano.[27] Tubercular fistulae are often multiple; for example, 12 out of 15 cases of multiple fistulae have been reported, though fewer in some cases.[22]

- **Peritoneal Tuberculosis:** Tuberculous peritonitis is more common among females than males. The risk factors for peritoneal TB are HIV infection, liver cirrhosis, diabetes mellitus, malignancy, and continuous ambulatory peritoneal dialysis.

  Tuberculous peritonitis is the most common form of abdominal tuberculosis, presenting as the ascitic type in approximately 97% of cases[28,29]. Localized or generalized ascites, accompanied by fine strands of adhesions and filmy membranes, is typically observed. Tubercles are studded across both the parietal and visceral peritoneum.

  The remaining 3% of cases present as the plastic or fibroadhesive type, where bowel loops are matted together due to the adhesion of masses of tubercles. These matted loops adhere to the mesentery and peritoneum, resulting in the obliteration of the peritoneal space.[30] The omentum may become palpable, rolled up, or thickened. This condition generally develops gradually over the course of months.

  It is manifested as abdominal distention, ascites and cystic lump secondary to loculated ascites. Constitutional symptoms of fever and night sweats may be present.

- **Esophagus:** Esophagus is rarely involved (~0.2%), mainly by extension of disease from adjacent lymph nodes in the mediastinum. Mid and upper esophagus are common sites. Low-grade fever, dysphagia, odynophagia are the presenting symptoms.[31] [32]

- **Gastric:** Due to paucity of lymphoid tissue and the presence of an acid, the stomach is an uncommon site for intestinal TB. The ulcerative form is the most common form, and in 80% of the cases, ulcers are seen on the lesser curvature of the stomach. Symptoms are nonspecific and include abdominal pain, nausea, vomiting, GI bleed, fever, and weight loss.[33]

- **Duodenal:** Third part is the most commonly affected site in the duodenum. Duodenal lesion may be intrinsic (ulcerative, hyper trophic or ulcerohypertrophic) or extrinsic (i.e. compression of duodenum by enlarged periduodenal lymph nodes from the outside). The largest published series of duodenal tuberculosis reported 30 cases from India;[34] most patients (73%) had symptoms of duodenal obstruction. In a majority of these cases obstruction was due to extrinsic compression by tuberculous lymph nodes, rather than by intrinsic duodenal lesion. The remainder (27%) had a history of dyspepsia and were suspected of having duodenal ulcers. Two of these patients presented with hematemesis. Other reported complications by various authors are perforation,[35] fistulae (pyeloduodenal, duodenocutaneous, blind),[36] and obstructive jaundice by compression of the common bile duct. Recently Mohite et al[37](from Mumbai reported a case of duodenal tuberculosis presenting with choledocho-duodenal fistulaColorectal: It can present with a nonspecific symptom or with weight loss, anemia and lower GI bleed. There can be diffuse or segmental colitis.

- **Hepatic and pancreatic tuberculosis:** Here's a more professionally revised version of your text regarding liver and pancreatic tuberculosis: The liver is frequently affected in conjunction with miliary tuberculosis. In a study of 41 patients with hepatic tuberculosis in South Africa, variations in size and consistency of the liver were observed**[38]**. Hepatic involvement is typically diffuse, while macronodular forms are rare.**[38,39]**

  Pancreatic tuberculosis can mimic pancreatic tumors, presenting with symptoms such as abdominal pain, weight loss, anorexia, and, occasionally,

obstructive jaundice due to a mass at the head of the pancreas. Additionally, tuberculous pancreatic abscesses have been reported in patients with AIDS.[40]

- **Splenic Involvement:** In abdominal tuberculosis, the spleen may be involved, presenting as splenic enlargement, hypersplenism, abscess formation, and fever. While medical management is essential, splenectomy is often required in severe cases. HIV-positive drug abusers may present with multiple splenic abscesses.**[41]**

- **Ileocaecal tuberculosis:** Typical features of ileocaecal tuberculosis include colicky abdominal pain accompanied by vomiting. On abdominal examination, a well-defined, mobile mass may be palpated in the right lower quadrant, though sometimes the examination may reveal no abnormalities or a doughy consistency.

  Lymphadenitis may be associated, presenting as multiple palpable lumps. The mobility of the lump depends on the lymph nodes involved: if mesenteric nodes are affected, the lump is typically mobile; however, if para-aortic or iliac nodes are involved, the mass tends to be fixed.[16]

- **Segmental colonic tuberculosis:**
  Segmental, also referred to as isolated colonic tuberculosis, involves the colon without affecting the ileocaecal region. This type accounts for 9.2% of cases of abdominal tuberculosis, with the sigmoid, ascending, and transverse colon being the most commonly affected sites.[42]
  Between 78% to 90% of patients present with abdominal pain, while less than one-third experience hematochezia.[25,43] Additional features of segmental tuberculosis include fever, weight loss, anorexia, and changes in bowel habits.

- **Rectal tuberculosis**: Haematochezia is the most common symptom (88%) followed by constitutional symptoms (75%) and constipation (37%)[44]The high frequency of rectal bleeding may be because of mucosal trauma caused

by scybalous stool traversing the strictured segment. Digital examination reveals an annular stricture. The stricture is usually tight and of variable length with focal areas of deep ulceration.[45]

They are often confused with rectal carcinoma.[46] Elderly men with anorectal lesions may present with abscesses and fistulas with concomitant pulmonary disease.[47]

**COMPLICATIONS:**

Complications include:

- Obstruction: Acute or subacute
- Perforation: Generalized or localized
- Abscess Formation
- Gastrointestinal Bleeding

Most instances of bleeding are not life-threatening; however, ulceration in the transverse colon can result in lower abdominal bleeding.

**Tan** conducted a retrospective analysis of abdominal tuberculosis in 57 patients, 37 of whom were men. The median age was 47 years, ranging from 14 to 74 years. Among these patients, 47% (27 patients) had active pulmonary tuberculosis, while 30% were HIV-positive, and 58% had not been tested for HIV.

Key findings indicative of abdominal tuberculosis included bowel thickening, ascites, lymphadenopathy, abscess formation, and free gas, which is suggestive of perforation.

In Tan's study, bowel involvement was observed in 33 patients, while 24 had mesenteric lymphadenopathy. Peritoneal involvement was seen in 13 patients, with seven showing splenic involvement. Pancreatic and anal involvement was identified in two patients each, and the liver was affected in two cases.

Disseminated tuberculosis, including pulmonary involvement, was present in 27 patients (47%), while isolated intra-abdominal tuberculosis was observed in 30 patients (53%).[48]

**Aggarwal** conducted a retrospective review of 50 pediatric cases of abdominal tuberculosis admitted to a tertiary hospital in Mumbai. Of the 50 cases, definite surgery was performed in 31 patients (62%) due to complications or emergencies, while the remaining 19 patients (38%) were managed medically following diagnostic procedures such as laparoscopy, open biopsy, or ultrasound-guided biopsy.

The most common presentation was acute intestinal obstruction, occurring in approximately 62% of cases. The erythrocyte sedimentation rate (ESR) was used as a prognostic indicator, being elevated in 88% of patients. Additionally, coexistent pulmonary tuberculosis was found in about 50% of cases.

Here’s a more professionally revised version of your text on Sheikh's study of abdominal tuberculosis cases.[22]

**Sheikh** conducted a prospective study of 26 cases of abdominal tuberculosis. The study included 10 male and 16 female patients, with a mean age of 33 years (ranging from 14 to 66 years). The varied presentations of abdominal tuberculosis included abdominal pain in 88.46% of patients, fever in 84.6%, weight loss in 69.2%, an abdominal mass in 46.1%, and abdominal distension (ascites) in 26.9%.[49]

## SUBACUTE INTESTINAL OBSTRUCTION

## DUE TO ABDOMINAL TUBERCULOSIS

Abdominal tuberculosis constitutes 11-13% of Extra pulmonary tuberculosis (EPTB) in India. It poses a diagnostic challenge because it presents with a myriad of manifestations.

The abdomen is involved in 11% of patients with extra-pulmonary tuberculosis, and can provide a diagnostic challenge if not suspected.[50]

The incidence of intestinal obstruction due to tuberculosis ranges from 12% to 60%.[51–53] In India, about 3% to 20% of all intestinal obstructions are due to tuberculosis of the abdomen in various forms.[54] The incidence of intestinal obstruction due to tuberculosis in our study was 4.5%. According to Das and Shukla,[55] Bhansali,[54] Paustian and Marshall,[17,52] and Paustian and Bockus,[56] intestinal obstruction is the most common complication of intestinal tuberculosis.

According to many authors,[51,52,56–58] intestinal tuberculosis often occurs in the ileocaecal region (52%–85%) . The hypertrophic form is the most common type, and, because it tends to constrict the lumen,[52,56] it causes intestinal obstruction. Our results correlated with other reports. We have also noted that, apart from the main obstructing lesion, other lesions may occur at various sites in the intestine, with the potential to cause obstruction later. These sometimes cause difficulty in making a decision about the length of intestine to resect or the site of anastomosis to the small bowel.

The symptoms and signs of intestinal tuberculosis, as well as intestinal obstruction caused by it, are often non-specific, complicating accurate diagnosis. Studies have shown varied diagnostic accuracy[59] with Hoon reporting 34% and Das and Shukla 50%. In our findings, only 54.5% of cases were diagnosed correctly.[55]

While diagnosing the presence of intestinal obstruction through clinical and radiographic data is relatively straightforward, establishing tuberculosis as the underlying cause is challenging, particularly in patients without a prior history of tuberculosis or those with normal chest X-rays. Symptoms such as malaise, fever, and

diarrhea are often not prominent, and colicky abdominal pain—indicative of partial intestinal obstruction—can also present in cases of obstruction from other etiologies, notably cancer. Additionally, abdominal distension makes it rare to palpate a mass in the right lower quadrant.

In emergency situations, the tuberculin test is impractical, and bacteriological examinations of feces are infeasible during intestinal obstruction. Apart from elevated erythrocyte sedimentation rate (ESR) and abnormal chest X-ray findings, other laboratory tests offer limited diagnostic value. This underscores the necessity for heightened awareness of tuberculosis among clinicians, particularly when encountering patients with intestinal obstruction of unclear origin.[58]

Such vigilance is essential for timely diagnosis and appropriate management of this condition.

In view of our experience, we highlight the following common features in diagnosis:

The clinical presentation of low-intestinal obstruction in patients without a history of prior laparotomy often includes prolonged symptoms of partial intestinal obstruction, which can persist for weeks or even months. Key indicators include:

- **Medical History**: A background of tuberculosis, whether pulmonary or intestinal, is common. Chest radiographs at the time of admission typically reveal advanced pulmonary tuberculosis.
- **Physical Condition**: Patients are usually notably thin or severely malnourished, reflecting the chronic nature of the condition.
- **Diagnostic Imaging**: Abdominal plain films confirm the presence of intestinal obstruction, typically localized to the lower small intestine.
- **Laboratory Findings**: An elevated erythrocyte sedimentation rate (ESR) is often observed, suggesting an inflammatory process.

Overall, a combination of clinical history, imaging studies, and laboratory results plays a crucial role in diagnosing low-intestinal obstruction due to tuberculosis.

In cases of subacute intestinal obstruction, it is crucial to consider tuberculosis as a differential diagnosis. The non-specific nature of the symptoms associated with

intestinal tuberculosis can often lead to delays in diagnosis. Recognizing the possibility of TB as a cause of subacute obstruction is essential, particularly in regions with a high prevalence of the disease. Early identification and appropriate management of tuberculous obstruction can significantly improve patient outcomes and prevent further complications. Therefore, clinicians should maintain a high level of suspicion for tuberculosis in patients presenting with subacute intestinal obstruction, ensuring timely intervention and treatment.

The management of intestinal obstruction due to tuberculosis remains a topic of debate among clinicians.[60]

- **Conservative Management**: Bhansali[16] recommends a vigilant approach involving conservative management with regular reassessment every six hours. If the obstruction resolves, elective surgery can be scheduled for 2 to 4 weeks later. This approach allows for the possibility of recovery without the need for surgical intervention.

  The treatment of intestinal tuberculosis typically involves a standard regimen of anti-TB medications administered over a six-month period. This regimen usually consists of four first-line drugs: Isoniazid (INH), Rifampicin (RMP), Pyrazinamide, and Ethambutol, which are given for the initial two months. Following this, a continuation phase of four months involves the administration of two drugs, INH and RMP.

  Close monitoring is essential during the first few months of treatment, as this period is critical for assessing the patient's response to therapy and identifying any potential recurrence of the disease. Regular follow-ups should be scheduled to evaluate the patient's clinical status and to ensure adherence to the medication regimen. It is important to note any signs of recurrence during this time, as early intervention can significantly improve outcomes.

  The successful treatment of the patient with anti-TB drugs underscores the effectiveness of appropriate medical management in resolving intestinal tuberculosis. Timely recognition and intervention are crucial in preventing complications and improving patient outcomes.

In summary, adherence to the prescribed treatment protocol and vigilant monitoring are crucial components of managing intestinal tuberculosis effectively.

- **Surgical Intervention**: On the other hand, Sherman et al.[61] argue that surgery should only be considered if the obstruction persists. They report that about 50% of their cases responded positively to medical management alone. This perspective is supported by the observation in our study, where abdominal plain films showed that 39% of patients still had fecal matter and gas present in the colon, indicating that the obstruction was not fully complete and conservative management could still be effective.

In conclusion, while conservative management may yield favorable outcomes for a significant number of patients, careful monitoring and reassessment are crucial. Surgical intervention should be reserved for cases where conservative measures fail to alleviate the obstruction

Many authors advocate for surgical management of intestinal obstruction due to tuberculosis, particularly because the obstructed lesions are frequently hypertrophic in nature. This hypertrophic form of intestinal tuberculosis often proves resistant to medical management alone, necessitating surgical intervention.

Surgical management not only addresses the immediate obstruction but also provides the added benefit of obtaining tissue specimens for accurate pathological diagnosis. This is crucial for confirming the presence of tuberculosis and guiding subsequent treatment plans. By ensuring a definitive diagnosis, clinicians can tailor anti-tuberculosis therapy more effectively, potentially improving patient outcomes and reducing the likelihood of recurrence.

In summary, while conservative management has its merits, surgical intervention remains a vital option, especially in cases where medical treatment is inadequate or when a definitive diagnosis is required. [60]

## DIAGNOSIS AND INVESTIGATIONS

At the turn of the century, there was a growing consensus that an accurate point-of-care test for tuberculosis (TB) was essential to make meaningful progress in reducing the global burden of the disease. Although numerous novel diagnostic tests had been developed by research groups and small biotech companies, they had yet to be standardized or evaluated for scalability and practical use in low-resource, high-burden settings—where the need for efficient and accessible TB diagnostics is most critical. The lack of standardized testing limited the impact of these innovations on controlling the pandemic, underscoring the importance of global collaboration and investment in developing reliable TB diagnostics suited for widespread deployment.

This need for accurate diagnostics led to a significant effort to systematically evaluate existing TB tests, such as commercial liquid culture and nucleic acid amplification tests (NAAT). Additionally, there was a push to develop new diagnostic approaches. These efforts were primarily spearheaded by the Foundation for Innovative New Diagnostics, in collaboration with industry, government, and clinical partners. Foundation for Innovative New Diagnostics played a pivotal role in assessing the effectiveness of available tests and fostering innovation, helping to bridge the gap between research and practical application in low-resource, high-burden settings.[62]

Paustian[39] put forth four criteria to diagnose abdominal tuberculosis in 1964:

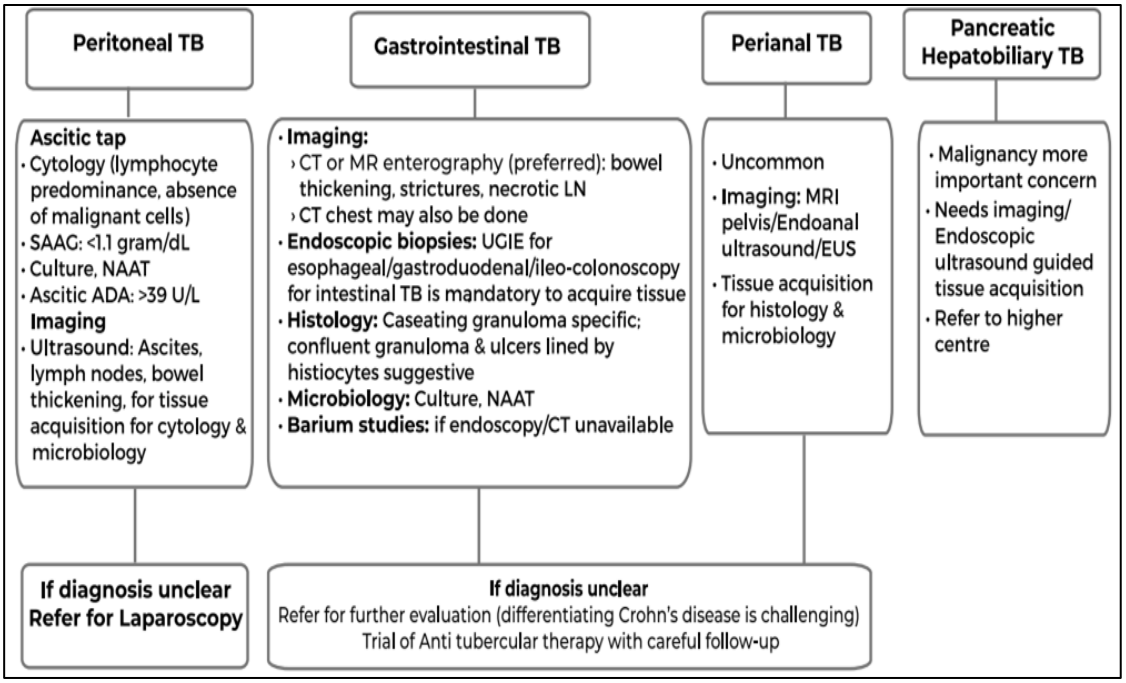
1. Caseation necrosis with evidence of tubercles histologically.
2. Gross typical operative findings along with histologic evidenceof tuberculosis in biopsy specimen of mesenteric nodes.
3. M. tuberculosis must grow either on animal inoculation or in culture of suspected tissue and
4. Acid-fast bacilli must be demonstrated in a lesion.

Modern clinical microbiology laboratories employ a variety of methods that enable accurate and rapid diagnosis of tuberculosis (TB), playing a crucial role in disease control efforts. Molecular diagnostic techniques have significantly reduced the time to diagnosis and are now integral to the diagnostic process in many settings. Traditional

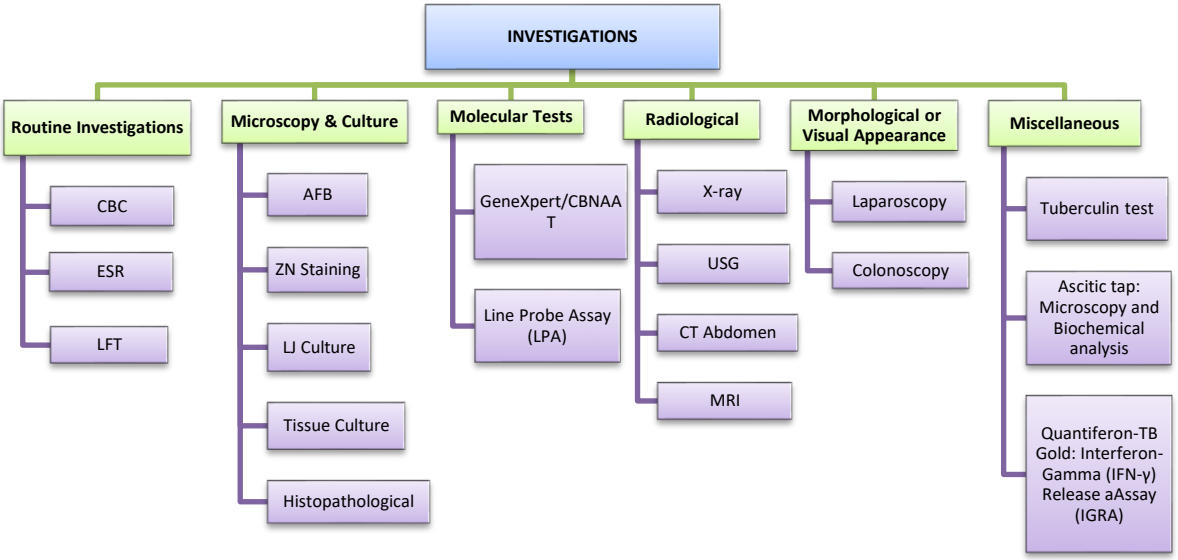
methods such as direct microscopy, culture, and drug susceptibility testing remain essential, but expanding access to these methods and integrating molecular diagnostics should be a priority for TB control.

Although no single clinical sign, laboratory test, endoscopic finding, radiological sign, or even bacteriological and histopathological result serves as a gold standard for diagnosing abdominal tuberculosis (TB), a combination of thorough radiological and histopathological studies is typically essential for making an accurate diagnosis. The complexity and variability of abdominal TB presentation require a comprehensive diagnostic approach, as individual markers often lack specificity. Therefore, the integration of these methods plays a critical role in confirming the presence of the disease, especially in cases with non-specific clinical symptoms.[63]

**EVALUATION FOR SUSPECTED ABDOMINAL TUBERCULOSIS**[64]


Peritoneal TB
Gastrointestinal TB
Perianal TB
Pancreatic Hepatobiliary TB
Ascitic tap
• Cytology (lymphocyte predominance, absence of malignant cells)
• SAAG: <1.1 gram/dL
• Culture, NAAT
• Ascitic ADA: >39 U/L
Imaging
• Ultrasound: Ascites, lymph nodes, bowel thickening, for tissue acquisition for cytology & microbiology
• Imaging:
› CT or MR enterography (preferred): bowel thickening, strictures, necrotic LN
› CT chest may also be done
• Endoscopic biopsies: UGIE for esophageal/gastroduodenal/ileo-colonoscopy for intestinal TB is mandatory to acquire tissue
• Histology: Caseating granuloma specific; confluent granuloma & ulcers lined by histiocytes suggestive
• Microbiology: Culture, NAAT
• Barium studies: if endoscopy/CT unavailable
• Uncommon
• Imaging: MRI pelvis/Endoanal ultrasound/EUS
• Tissue acquisition for histology & microbiology
• Malignancy more important concern
• Needs imaging/ Endoscopic ultrasound guided tissue acquisition
• Refer to higher centre
If diagnosis unclear
Refer for Laparoscopy
If diagnosis unclear
Refer for further evaluation (differentiating Crohn's disease is challenging)
Trial of Anti tubercular therapy with careful follow-up

## Investigation Protocol:




*CBC: Complete Blood Count , ESR: Erythrocyte Sedimentation Rate, LFT: Liver Function Test, AFB:Acid Fast Baccili, ZN Staining: Ziehl Nelsen, LJ Staining: Lowenstein-Jensen, CBNAAT: Cartridge-Based Nucleic Acid Amplification Test, USG: UltraSonography*

## Microscopy & Culture

### Acid-Fast Bacilli & Ziehl-Neelsen

One microbiological examination used to diagnose intestinal tuberculosis is acid-fast bacilli (AFB) staining. A commonly employed method for AFB staining is the Ziehl-Neelsen (ZN) method, a conventional technique for microscopically identifying Mycobacterium tuberculosis and Mycobacterium leprae bacteria. This method utilizes specific staining to highlight the acid-fast characteristics of these bacteria, making them visible under a microscope. Despite being widely used, the Ziehl-Neelsen method may require further confirmatory tests due to its limited sensitivity, particularly in cases with low bacterial load.[65]

Mycobacterium tuberculosis culture is a very specific examination, where the specificity value reaches 100%, but the sensitivity value is only 9.3% with a positive predictive value (PPV) of 100% and a negative predictive value (NPV) of 38.29%. As a gold standard examination, culture examination is still recommended especially for patients who will undergo a colonoscopy and bronchoscopy procedure and take a tissue specimen.[66–68]

Histopathological examination and culture of M. tuberculosis have their respective advantages and disadvantages, so it is advisable to do a combination of the results of both tests. The combination of these two will increase diagnostic accuracy by 17%.[69]

**Sputum:**

Sputum collection is a key diagnostic method for suspected tuberculosis patients. Early morning sputum samples are typically collected on two consecutive days and sent for culture, as this time yields higher bacterial loads. In hospitalized patients, 8-hourly sputum samples may be collected. For individuals unable to produce sputum spontaneously, sputum induction can be performed using hypertonic saline to stimulate sputum production.

In children, gastric aspirates are often preferred as the specimen for TB diagnosis, typically collected in the early morning. Alternatively, a transbronchial biopsy with bronchial washings using a fiber-optic bronchoscope may be conducted to obtain a sample when needed for a more direct examination of the respiratory tract.

In certain cases, bone marrow, liver biopsies, or blood cultures are occasionally used to aid in diagnosing tuberculosis, particularly in cases where extrapulmonary TB is suspected.

However, these methods may take several weeks to culture and identify the growth of Mycobacterium tuberculosis.

Advances in molecular diagnostics, such as ribosomal RNA probes and DNA polymerase chain reaction (PCR), have revolutionized TB diagnosis. These technologies enable identification of the bacteria within 24 hours, significantly reducing the time to diagnosis. DNA probes can be applied to both smear-positive and smear-negative sputum samples, although the sensitivity of these tests is higher with

smear-positive specimens. This rapid identification plays a critical role in improving patient outcomes and controlling the spread of the disease.

**GeneXpert / Cartridge-Based Nucleic Acid Amplification Test(CBNAAT):**

The GeneXpert assay is a highly advanced, fully automated real-time PCR-based diagnostic test designed for the rapid detection of Mycobacterium tuberculosis (MTB) and its resistance to rifampicin. This test is widely recognized for its high sensitivity and specificity, making it an essential tool for the early diagnosis of TB.

GeneXpert's efficiency lies in its ability to deliver accurate results within approximately two hours, which is a significant improvement over conventional methods like culture, which can take weeks. The assay is particularly useful in high-burden settings where timely diagnosis can lead to early treatment and better outcomes.[69,70]

The test's sensitivity can approach 100%, especially in smear-positive all TB cases, while its specificity ensures that false positives are minimal. Because of these strengths, the GeneXpert assay has become a routine and crucial tool in diagnosing tuberculosis, especially in settings with limited resources and high TB prevalence.

Some studies have also applied the GeneXpert assay to diagnose extrapulmonary tuberculosis, including intestinal tuberculosis. The test has shown high sensitivity and specificity in these cases, making it a valuable diagnostic tool for patients with suspected intestinal TB. Its rapid turnaround time and accuracy make it particularly useful for early detection and treatment initiation.

However, despite its strengths, GeneXpert is not widely available in many healthcare settings, particularly in resource-limited hospitals. Additionally, while it provides good diagnostic accuracy, it still cannot replace microbiological examination, such as culture, which remains the gold standard for diagnosing TB.

However, a key disadvantage of the GeneXpert assay is its limited availability in many hospitals, particularly in resource-constrained settings. This restricts its widespread use, despite its advantages in terms of speed and diagnostic accuracy.[69,70]

**Line Probe Assay (LPA):**

Line Probe Assay (LPA) is a rapid diagnostic technique based on polymerase chain reaction (PCR), used to detect the Mycobacterium tuberculosis (MTB) complex and determine drug sensitivity to rifampicin (RMP) and isoniazid (INH). This test is employed under India's Revised National Tuberculosis Control Programme (RNTCP). LPA is performed only on sputum samples that are smear-positive for acid-fast bacilli (AFB).[71]

**Quantiferon-TB Gold: Interferon-Gamma (IFN-γ) Release aAssay (IGRA):** Currently, T-cell-based interferon-gamma (IFN-γ) release assays (IGRAs) are increasingly used to replace the tuberculin skin test (TST) for diagnosing tuberculosis. Interferon-Gamma (IFN-γ) Release aAssay (IGRAs) have demonstrated higher accuracy compared to tuberculin skin test, particularly because tuberculin skin test can yield false-positive results in patients who have received the Bacillus Calmette-Guérin (BCG) vaccine. Additionally, tuberculin skin test often shows false-negative results in immunosuppressed patients, making Interferon-Gamma (IFN-γ) Release aAssay (IGRA) a more reliable option in such cases.[72]

A positive result from T-cell-based interferon-gamma (IFN-γ) release assays (IGRAs), such as QuantiFERON-TB Gold+, does not differentiate between active and latent tuberculosis (TB). Additionally, cross-reactivity with certain non-tuberculous mycobacteria, including M. kansasii, M. szulgai, and M. marinum, can occur, potentially leading to false-positive results. Furthermore, neither IGRAs nor tuberculin skin testing can predict the risk of progression from latent TB to active TB, limiting their utility in assessing disease status and potential outcomes.[73]

**Mantoux test:**

The Mantoux test, also known as the Tuberculin Skin Test or PPD test (Purified Protein Derivative), is used to diagnose tuberculosis.

Mantoux Technique:

A standard dose of 5 Tuberculin units (0.1 ml) is injected intradermally and read 48 to 72 hours later.

Individuals previously exposed to TB will show an immune response in the form of induration at the injection site.

The reaction is measured by the diameter of induration across the forearm in millimeters; erythema (redness) is not counted.

A result of "0 mm" indicates no induration.

The test is indicated for individuals with a history of a positive tuberculin skin test or a recent negative test within the past year.

Induration Results for Mantoux Test:

**Induration of 5 mm or more is considered positive in:**

- HIV-infected patients
- Recent contacts with a TB case
- Individuals with old, healed TB and chest X-ray changes (e.g., nodular or fibrotic changes)
- Immunosuppressed patients and organ transplant recipients

**Induration of 10 mm or more is positive in:**

- Recent arrivals (within the last 5 years) from high-prevalence countries Injection drug users
- Residents and employees of high-risk congregate settings (e.g., prisons, nursing homes, hospitals, homeless shelters)
- Mycobacteriology lab personnel
- Individuals with clinical conditions that increase TB risk (e.g., diabetes, prolonged corticosteroid therapy, leukemia, end-stage renal disease, chronic malabsorption syndromes, low body weight)
- Children under 4 years or those exposed to adults in high-risk categories

**Induration of 15 mm or more is positive in:**

- Individuals with no known risk factors for TB

**Ascitic fluid examination:**

Ascitic fluid ADA is a useful test for the diagnosis of tuberculous peritonitis with good sensitivity and specificity however, with very low certainty of evidence evaluated by Grading of Recommendations, Assessment, Development and Evaluation approach.[74]

Ascites due to tuberculous peritonitis, identified through ultrasound-guided paracentesis, is characterized as exudative, appearing chylous and cloudy or turbid. The serum-ascites albumin gradient (SAAG) is now recognized as a more sensitive and specific indicator than the traditional ascitic total protein concentration for differentiating ascites caused by portal hypertension from other mechanisms, such as tuberculous ascites, which typically presents with a SAAG <1.1 g/dL and total protein levels exceeding 3–4 g/dL. Additionally, the combination of lactate dehydrogenase (LDH) with total protein analysis has been investigated for ascitic fluid assessment.

The cutoff values for differentiating hepatic from non-hepatic ascites in ascitic fluid are as follows: lactate dehydrogenase (LDH) >400 Sigma units, fluid/serum total protein (TP) ratio >0.5, and fluid/serum LDH ratio >0.6. The presence of any two of these findings typically indicates tuberculous ascites, while the absence of all three suggests a hepatic cause.**[75]**

In normal conditions, glucose concentration in ascitic fluid mirrors that in serum. However, in tuberculous peritonitis, glucose levels decrease due to consumption by bacteria, white blood cells, or cancer cells, making low ascitic glucose levels a distinguishing factor between TB and other conditions like cirrhosis. The ascitic/blood glucose ratio is also helpful in differentiating TB peritonitis from other ascitic causes.**[76]**

Adenosine deaminase (ADA) activity in ascitic fluid is a sensitive and specific marker for early TB diagnosis, with levels exceeding 40 U/L indicating TB ascites.**[77,78]**

High levels of interferon-gamma in tuberculous ascites have been reported as a useful diagnostic marker. Measuring both adenosine deaminase (ADA) and interferon-gamma can enhance the sensitivity and specificity of diagnosing tuberculous ascites.**[79]**

**Radiological studies**

**Chest X-ray:**

Chest X-rays may reveal signs of tuberculosis; however, they are often normal in most cases and are typically used to support the diagnosis. Sharma et al.[15] reported active or healed lesions in 46% of 70 patients with abdominal tuberculosis, with X-rays being positive in approximately 80% of patients presenting with acute complications.

In a study of 300 patients, Prakash[80] found that none had active pulmonary TB, though 40% exhibited healed lesions. Tandon et al.[23] reported positive X-ray findings in only 25% of patients, indicating that concomitant pulmonary disease is not evident in 75% of cases.

**Plain X-ray abdomen:**

Major findings on plain abdominal X-ray include enteroliths, signs of obstruction such as dilated bowel loops and multiple air-fluid levels, as well as complications like perforation, ascites, and intussusception. Additionally, calcified lymph nodes, hepatomegaly, splenomegaly, and granulomas may also be observed.

Radiological investigations are crucial for diagnosing abdominal tuberculosis.**[81]** Homan et al.**[82]** found that while a normal chest X-ray**[22,23]** can help exclude abdominal tuberculosis, 25% of patients still exhibit positive findings. Although X-ray findings indicating active or healed tuberculosis can support the diagnosis of abdominal tuberculosis, a normal chest X-ray does not definitively rule it out.

**Ultrasonography:**

Ultrasound is essential for imaging and diagnosing peritoneal tuberculosis.

Abdominal ultrasound has 63% sensitivity and 68% specificity in diagnosing abdominal tuberculosis when the patient is confirmed to have tuberculosis infection.[85]

Key features indicative of peritoneal tuberculosis include:

- Intra-abdominal fluid that may appear free, clear, or complex.
- Loculated fluid with debris and septae.
- Fluid collections in the pelvis that can have thick septa, resembling ovarian cysts.

Abdominal ultrasound demonstrated greater sensitivity but lower specificity than chest radiography for diagnosing tuberculosis in this patient population.**[83]**

In a study assessing the normal sonographic appearance of the small bowel mesentery in healthy subjects, mesenteric thickness ranged from 7 to 12 mm, regardless of age or body habitus, although it was more easily identifiable in obese individuals. In contrast, our study of patients with abdominal tuberculosis revealed that the most common abnormalities were mesenteric thickening (greater than 15 mm) and mesenteric lymphadenopathy.**[84]**

**Signs of abdominal tuberculosis on ultrasonography include:**

- **"Club Sandwich" or "Sliced Bread" Sign:** This sign indicates localized fluid collections seen as exudation from the inflamed bowel between radially oriented bowel loops, known as interloop ascites.
- **Tuberculous Lymphadenopathy:** These lymph nodes exhibit a heterogeneous echotexture, contrasting with the homogeneous echoes found in lymphoma. They may appear as discrete or conglomerated (matted) forms, with anechoic zones indicating areas of caseation. After treatment, lymph nodes may initially increase in size for 3-4 weeks before gradually reducing.
- **Calcification:** Discrete reflective lines in healing lesions suggest calcification, which, along with caseation, indicates a tuberculous etiology, as these findings are not typically seen in malignancy-related lymphadenopathy.
- **Bowel Wall Thickening:** This thickening is concentric and uniform, distinguishing it from the eccentric thickening in Crohn's disease and the irregular thickening associated with malignancy. Bowel thickening is commonly observed in the ileocecal region.
- **Pseudokidney Sign:** This occurs when the ileocecal region is involved and is pulled up to a subhepatic position.

**Computed tomographic (CT) scan:**

It is the investigation of choice when intestinal TB is suspected. It enables us to identify intraluminal and extramural abnormalities.

Tuberculosis exhibits a broad range of clinical and imaging manifestations, potentially affecting various organs in diverse ways. Diagnosing it necessitates a high level of suspicion.

Ileocaecal tuberculosis typically presents as a hyperplastic type and is well-evaluated using CT scans. In the early stages, circumferential and symmetric thickening of the caecum and terminal ileum is observed. As the disease progresses, this thickening becomes asymmetrical, leading to gross wall thickening, adherence of bowel loops, and thickening of nodes accompanied by a soft tissue mass around the ileocaecal junction.[85]

CT scans may reveal nodularity or ulceration in the terminal ileum, often associated

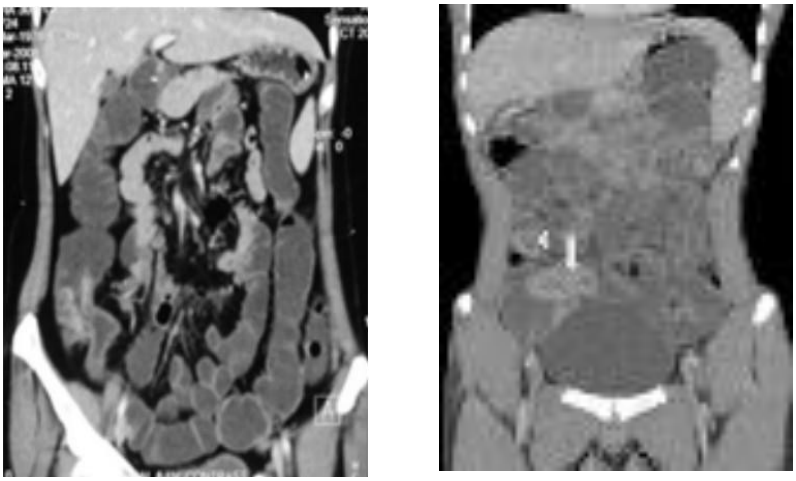
with narrowing and proximal dilatation. Circumferential wall thickening, narrowed lumen, and ulceration can also occur in other bowel areas, with the hepatic flexure being involved if the colon is affected.

Complications such as perforation, abscess formation, and obstruction are common. Mesenteric disease may appear as patchy or diffuse stellate lesions with increased density, accompanied by strands within the mesentery. Lymph nodes appear interspersed, while thickening of the omentum can resemble the "omental cake" appearance. A fibrous wall over the omentum, referred to as the omental line, develops due to chronic inflammation and is less commonly associated with malignant infiltration.[86]

In tuberculosis, caseated lymph nodes often exhibit centers that are hypodense with enhancement of the peripheral rim, and the presence of calcification further supports the diagnosis. Commonly affected areas include the mesentery, mesenteric root, peri-pancreatic nodes, and celiac and porta hepatis regions. Notably, retroperitoneal nodes, such as the periaortic and pericaval nodes, are typically spared and are not observed in isolation, contrasting with findings in lymphoma.[85]

**CT Enterography Protocol**

The technique of CT enterography combines small bowel distension with a oral contrast mixture and abdomino-pelvic CT examination during the enteric phase following administration of intravenous contrast.



A B

Fig. Image ‘A’shows the CT scan of a patient with thickened terminal ileum (arrows). Other small bowel loops also show mild mural thickening and hyperenhancement (arrowheads), (B) shows the characteristic ileocecal involvement(Arrow).[87]

Summary of clinical imaging findings and key differential diagnoses of the spectrum of abdominal tuberculosis.[88]

| Diagnosis | | Imaging findings |
|---|---|---|
| **Tuberculous Lymphadenitis** | | USG:<br>Enlarged hypoechoic nodes (± matted appearance) or hyperechoic nodes with posterior shadowing (due to calcifications)<br>CT First stage:<br>Homogenous enhancement |
| **Gastrointestinal tuberculosis** | Esophagus | Endoscopic US Asymmetric wall thickening with loss of wall stratification, mucosal ulceration and adjacent LAD<br>CT Scan:<br>Irregular diffuse wall thickening, fistulous tracts, diverticula, or strictures with LAD |
| | Stomach & duodenum | CT Scan:<br>Irregular diffuse wall thickening (most commonly at the antrum and distal body) with ulceration, fibrosis, sinus and fistula tracts (rare) and LAD |
| | Small intestine & colon | CT Scan:<br>Diffuse wall thickening of affected segment (predominantly in the terminal ileum and cecum) with surrounding fat stranding and LAD |
| **Hepatosplenic tuberculosis** | | USG:<br>Multiple variable size hypoechoic lesions<br>Late stage: calcifications<br>CT Scan:<br>Multiple variable size hypodense lesions with central or peripheral post-contrast enhancement, LAD, ascites and peritonitis<br>Late stage: Calcifications |

| | |
|---|---|
| **Tuberculous peritonitis** | MRI:T Wet:<br>Free or loculated ascites with nodular peritoneal enhancement and omental caking Fibrotic: Omental thickening and omental caking, fixed bowel loops, matted bowel and mesentery ± loculated ascites, abdominal cocoon/ encapsulating peritoneal sclerosis (late stage)<br>Dry: Fibrous adhesions of bowel loops, mesenteric thickening, and caseous mesenteric lymphadenopathy |
| **Tuberculous abscess** | CT Scan and MRI:<br>Multiloculated peripherally enhancing abscess with surrounding fat stranding and peripherally enhancing necrotic LAD and foci of calcifications |

*Abbreviations: LAD = lymphadenopathy.*

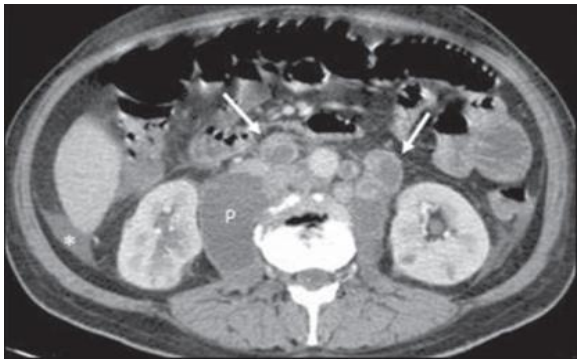


Fig.1: Multiple enlarged lymph nodes with central necrosis in periaortic, pericaval and interaortocaval chains (arrows)[89]

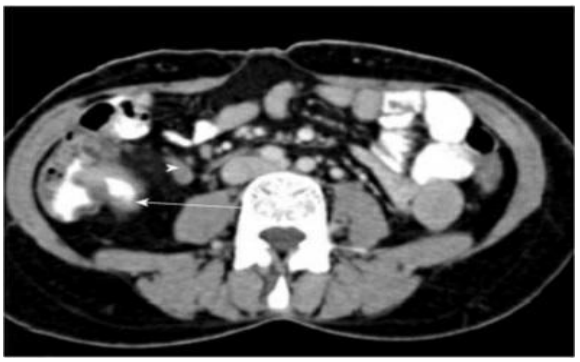


Fig.2. Axial computed tomography image in a patient with intestinal tuberculosis demonstrating short segment ileocaecal thickening (arrow) with necrotic lymph node (arrowhead)[90]

**Barium Studies:**

While there is no isolated radiological feature that definitively diagnoses intestinal or peritoneal tuberculosis, a combination of distinct imaging findings can support a confident diagnosis in the appropriate clinical context. Barium studies may reveal luminal narrowing with or without obstruction, which can result from lymphadenopathy, exophytic granulomatous masses, or adhesions. These conditions are best visualized using computed tomography (CT), which provides a comprehensive view of extraluminal factors. Previous studies have indicated that intestinal tuberculosis is a leading cause of intestinal obstruction, second only to adhesions. Therefore, integrating barium studies with CT, utilizing both oral and intravenous contrast, can enhance diagnostic accuracy for intestinal or peritoneal tuberculosis.[91]

**Small Bowel Barium Meal Findings in Tuberculosis:**

- "Chicken Intestine" Appearance: Characterized by hypersegmented barium column.
- Barium Characteristics: Barium is precipitated, flocculated, and diluted.
- Mucosal Changes: Mucosal folds appear thick and stiffened.
- Lumen Narrowing: Stenosis is present, creating "hourglass" contours.
- Bowel Loops: Display multiple strictures and segmental dilatation, often with matting of loops.

**Barium enema:**

Features Observed in Ileocaecal Tuberculosis:[92]

- Early Findings: Spasm and edema of the ileocaecal valve, characterized by thickened margins and a gaping valve, with a narrowed terminal ileum. This is known as the "Fleischner" or "inverted umbrella sign."
- Double Contrast Study: Reveals fold thickening and contour irregularity in the terminal ileum.
- Conical Caecum: Contraction and fibrosis of the mesocolon may cause the caecum to shrink and retract from the iliac fossa, potentially pulling down the hepatic flexure as well.
- Goose Neck Deformity: Loss of the ileocaecal angle with dilation of the

terminal ileum, making it appear suspended from a fibrosed and retracted caecum.

- Purse String Stenosis: A localized stenosis characterized by a smooth caecum with a dilated terminal ileum opposite the ileocaecal valve.
- Stierlin's Sign: Indicates narrowed terminal ileum that rapidly empties into a short, obliterated, or rigid caecum. Inflamed segments typically do not retain barium, while normal segments on either side do. This sign is observed when acute inflammation occurs on a chronically diseased segment.
- String Sign: Refers to a persistently narrow barium column indicating stenosis.
- Note: Stierlin's and String signs can also occur in Crohn's disease, so they are not specific for tuberculosis. An enteroclysis followed by a barium enema may be the best protocol for evaluating intestinal tuberculosis.

**Double-Contrast Barium Enema Findings in Ileocaecal Tuberculosis:**

Ileocaecal tuberculosis is characterized by:

- Shortened ascending colon and caecum, presenting as irregular and deformed.
- Incompetent and distorted ileocaecal valve, accompanied by a dilated ileum.
- An obtuse angle at the ileocaecal junction.[92]

While barium studies are sensitive for detecting ileocaecal and colonic lesions[93], they may miss small bowel strictures. Additionally, extra-intestinal lesions (such as those in the peritoneum and lymph nodes) can be misinterpreted as intestinal strictures.[84,94] Tandon et al.[23] reported that approximately 25% of patients exhibited false-negative results in barium studies. Furthermore, radiological assessments may struggle to differentiate between tuberculosis, Crohn's disease, and malignancy.[95]

**Barium Meal Follow-Through Findings in Intestinal Tuberculosis**

| | | |
|---|---|---|
| **Group I** | Highly suggestive of intestinal tuberculosis if one or more of the following features are present: | • Deformed ileocecal valve with dilated ileum<br>• Contracted cecum with abnormal ileocecal valve or terminal ileum<br>• Stricture of the ascending colon with shortening or involvement of the ileocecal region |
| **Group II** | SuggestiveofIntestinaltuberculosis if oneof the following is present: | • Contracted caecum<br>• Ulceration or narrowingof terminal ileum<br>• Stricture ofascendingcolon<br>• Multiple sites ofnarrowing and dilatation leading to formation of small bowel loops |
| **Group III** | Non-specificchanges | |
| **Group IV:** | Normal study | |

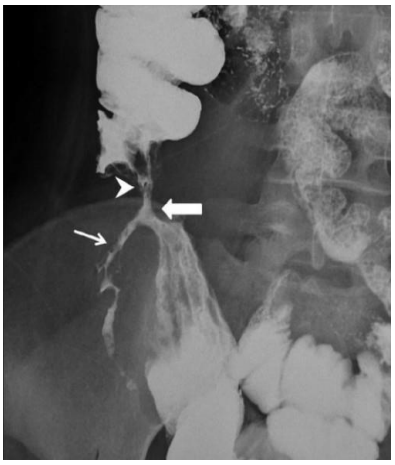


Fig. Ileocecal tuberculosis. Barium meal follow through showing severe narrowing of ileocecal junction (block arrow), contracted cecum (arrow), and adjacent ascending colon (arrow head)[96]

**Colonoscopy:**

Patients with gastrointestinal tuberculosis (GITB) often present with nonspecific symptoms, making diagnosis challenging, especially in nonendemic regions where a high index of suspicion is necessary. Common symptoms include abdominal pain and weight loss, while endoscopic findings typically reveal ulceration, patulous ileocecal valves, and luminal narrowing, primarily affecting the right colon.[66]

Patients with gastrointestinal tuberculosis typically present with nonspecific symptoms such as abdominal pain, distention, weight loss, decreased appetite, diarrhea, and vomiting. Physical signs are also vague, including malnutrition, ascites, abdominal distention, or a palpable mass. During colonoscopy, colonic TB may appear as ulcerative or nodular lesions, strictures, or, less commonly, colon polyps.[97–99]

Colonoscopy is a valuable procedure for diagnosing colonic and terminal ileal involvement in gastrointestinal tuberculosis, but it remains underutilized. Characteristic findings include mucosal nodules ranging from 2 to 6 mm and ulcers in colonic segments, typically 4 to 8 cm in length, which are considered pathognomonic. The cecum often contains numerous nodules with a pink surface near the ileocecal valve. Ulcers, varying in size from 10 to 20 mm or as small as 3 to 5 mm, can be seen between the nodules. The intervening mucosa may appear hyperemic or remain normal.[84]

Strictures with nodular and ulcerated mucosa are frequently observed in gastrointestinal tuberculosis (GITB). Up to 8-10 colonoscopic biopsies from the edge of these ulcers are typically taken for histopathology and culture. However, the diagnostic yield is often low, as the disease predominantly affects the submucosa. Granulomas are detected in 8-48% of cases, and caseation is found in approximately one-third (33-38%) of positive cases.[43] The detection of acid-fast bacilli (AFB) on stains varies across studies, and the presence of granulomas does not correlate with culture positivity.

Bhargava et al.[84] reported culture positivity in 40% of patients and emphasized that routine culture of biopsy tissue enhances the diagnostic yield. Combining histological examination with culture of biopsy samples successfully establishes the diagnosis in about 60% of patients.

Fig.3. Patulous ileocecal valve.[66]

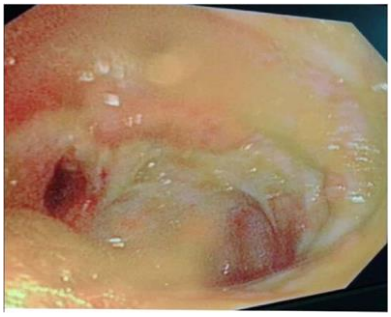
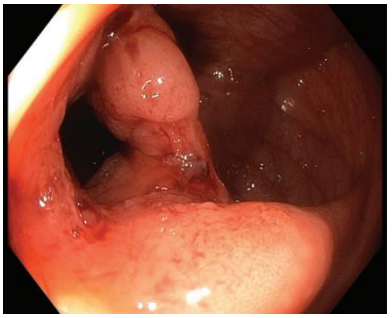


Fig.4. Patulous ileocecal valve with transverse ulcer[66]



Patulous ileocecal valve with ulceration in tuberculosis- representative picture[100]

**Laparoscopic findings:**

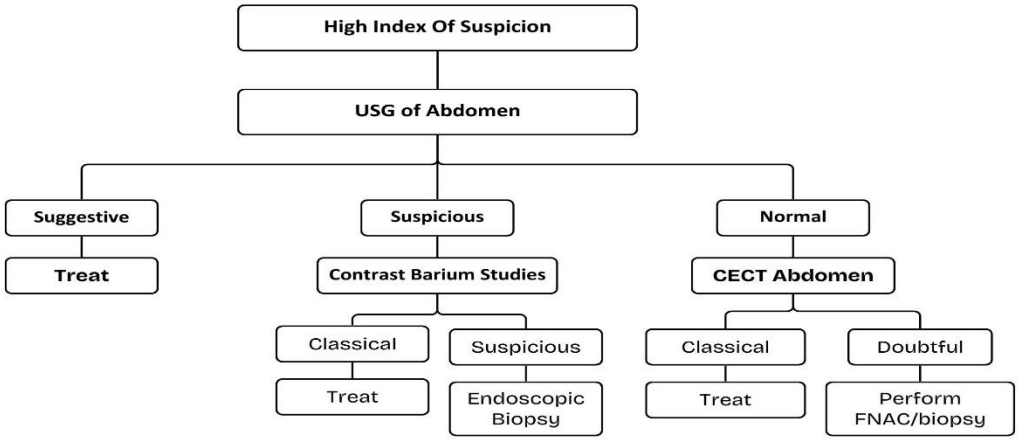
Laparoscopy is an effective and minimally invasive diagnostic tool for abdominal tuberculosis (TB). It allows direct visualization of the abdominal cavity and facilitates tissue biopsy and cultures, providing a reliable and accurate diagnosis and early laparoscopy may be useful to establish a histological diagnosis with acceptably low morbidity (8%).[101] By enabling histological confirmation, laparoscopy is considered the most specific diagnostic test for abdominal TB. Additionally, it can prevent the need for more costly and invasive procedures, offering a faster and more definitive diagnosis through direct tissue sampling and culture analysis.[102–105]

Bhargava et al.[84], in a study involving 87 patients, reported that ascitic fluid in tuberculosis typically contains high protein levels. Out of the 87 patients, 38 were diagnosed with tuberculosis. The study highlighted that visual examination during laparoscopy was highly accurate for diagnosing abdominal TB, with a reported accuracy of 95%. This was significantly higher than the diagnostic sensitivity of histology (82%), culture (3%), or guinea pig inoculation (37.5%). Additionally, caseating granulomas were identified in 85-90% of the biopsy samples, further reinforcing the role of laparoscopy in diagnosing abdominal tuberculosis.

The laparoscopic findings in peritoneal tuberculosis can be categorized into three distinct groups:

I. Peritoneum is thickened with numerous uniform, yellowish tubercles evenly distributed across the parietal peritoneum. These tubercles are also found on the omentum, liver, and spleen, giving these organs a studded appearance.
II. Peritoneum is thickened but without the presence of visible tubercles.

III. Thickened peritoneum with fibro-adhesive peritonitis, where multiple thick adhesions are observed, causing the fixation of abdominal viscera.




Algorithmic approach to diagnosis of abdominal tuberculosis[106]

In a study conducted by **Van Hai Nguyen**, a total of 513 cases of intestinal obstruction were documented during the specified period. Among these, 23 cases (4.5%) of intestinal obstruction were attributed to tuberculosis. Notably, out of 46 cases of intestinal tuberculosis that required surgical intervention during the same timeframe, intestinal obstruction due to tuberculosis accounted for 50% of these instances. The demographic data indicated that the majority of affected patients were over 30 years of age, comprising 95.6% of the cases, and there was a pronounced male predominance with a male-to-female ratio of 7:1. These findings underscore the significant impact of tuberculosis as a cause of intestinal obstruction, particularly in older patients and among males.**[107]**

In a study by **L V Gouri**, The most common presenting symptom was abdominal pain, observed in 35 patients (59.32%). A CT scan suggested abdominal tuberculosis in 31 cases, while seven scans were inconclusive. Histological analysis revealed tuberculosis in 37 patients (62.71%), whereas 22 patients (37.28%) tested negative. The positive predictive value (PPV) and negative predictive value (NPV) of the CT scan were 77.42% (95% CI: 60.19-88.61%) and 85.71%, respectively. Among 27 mesenteric lymph nodes assessed, 20 showed positive histology for tuberculosis. Additionally, 29 patients had caseating granulomas, and 12 had non-caseating granulomas. All 18 histology-negative patients exhibited nonspecific chronic inflammation with reactive lymph nodes. Peritoneal fluid was aspirated from 30 patients (50.84%) and sent for CBNAAT, resulting in 10 positive (33.33%) and 20 negative (66.67%) tests for the tuberculosis gene.[108]

**MANAGEMENT**

Our primary objective is to identify cases with a high index of suspicion, emphasizing the importance of thorough evaluation and therapeutic trials in suspected patientsThis approach is essential for enabling early diagnosis, which in turn reduces the risks of surgery and mortality associated with the disease.

**Management Protocol:**

1) Management of Acute intestinal obstruction
2) Management of Abdominal Koch's

I. Medical Management

II. Surgical Management

**1. Management Of Acute Intestinal Obstruction:**

**Conservative Management**

- **Nil Per Oral (NPO):**
    - Patients should be maintained on a nil per oral (NPO) status to prevent further gastrointestinal distension and allow the bowel to rest.
- **Nasogastric Tube Insertion:**
    - Nasogastric tube insertion will allow for bowel decompression to relieve distention proximal to the obstruction and will also help control emesis.
- **Intravenous Fluid Administration:**
    - Administer intravenous fluids to maintain hydration and ensure adequate circulatory volume.
- **Correction of Electrolyte Imbalance:**
    - Monitor serum electrolyte levels regularly and correct any imbalances that may be present, using appropriate electrolyte solutions as needed.

## 2. Management of Abdominal Koch's

### I). Medical Management:

**Antituberculous Drug Therapy:**

A standard six-month regimen of antituberculous drugs typically achieves a cure for tuberculosis at most sites (excluding the central nervous system), provided the bacilli are fully sensitive. The regimen includes isoniazid and rifampicin for the entire six months, with pyrazinamide added during the intensive phase (the first two months).

Historically, a 9-month therapy was the conventional approach for treating abdominal tuberculosis (TB). However, a recent multicenter, randomized trial has demonstrated that 6-month and 9-month regimens are equally effective for patients with abdominal TB, providing flexibility in treatment duration without compromising outcomes.[109,110]

In cases where drug resistance is suspected, a fourth drug (such as ethambutol) or a fifth drug (e.g., streptomycin) should be included during the intensive phase to increase treatment efficacy.

There are approximately 20 different antituberculous drug combination treatments available, tailored based on drug sensitivity patterns and patient-specific factors.

**Standardized Treatment Regimens (as per NTEP):**[111]

This regimen is for H & R sensitive TB cases and cases where the sensitivity pattern can not be established

Treatment is given in two phases:

1. Intensive phase consists of 8 weeks (56 doses) of isoniazid (H), rifampicin (R), pyrazinamide (Z) and ethambutol (E) given under direct observation in daily dosages as per weight band categories.
2. Continuation phase consists of 16 weeks (112 doses) of isoniazid, rifampicin and ethambutol in daily dosages. Only pyrazinamide will be stopped in the continuation phase.

Special considerations for Adult abdominal TB:**[111]**

• Extend duration of treatment in cases of inadequate response

• Refer for surgical management for complications [intestinal obstruction (due to strictures), perforation]

• Consider endoscopic dilatation for treatment for accessible strictures

• Refer for biliary drainage in case of Jaundice due to biliary obstruction (hepatobiliary obstruction/pancreatic TB)

Special considerations for paediatric Abdominal TB:[111]

• Steroids- Not recommended

• Supportive treatment- Management of SAM/Malnutrition as per national guidelines

• Surgical treatment:

- Acute intestinal obstruction, Bowel perforation
- Persistence of obstructive symptoms despite conservative management & ATT

• DO NOT start Empirical ATT with isolated:

- Recurrent/Chronic abdominal pain without danger signs
- Chronic diarrhoea without proper evaluation

**National Strategic Plan India 2020-2025**:[112]

- The National Strategic Plan (NSP) for TB Elimination in India (2020-2025) outlines the following recommended actions to accelerate progress toward TB elimination:
- Launch a TB elimination campaign inspired by successful lessons from the polio eradication initiative.
- Prioritize reinforcement of the existing healthcare workforce to ensure adequate capacity and expertise in TB management.
- Scale up engagement with private healthcare providers to expand the reach of TB care and diagnosis.
- Shift from passive community involvement to active community participation and ownership in the TB elimination effort.
- Invest in surveillance staff and systems to ensure the collection of accurate, complete, and timely TB-related data.
- Deploy new precision diagnostic tools to improve TB detection and management.

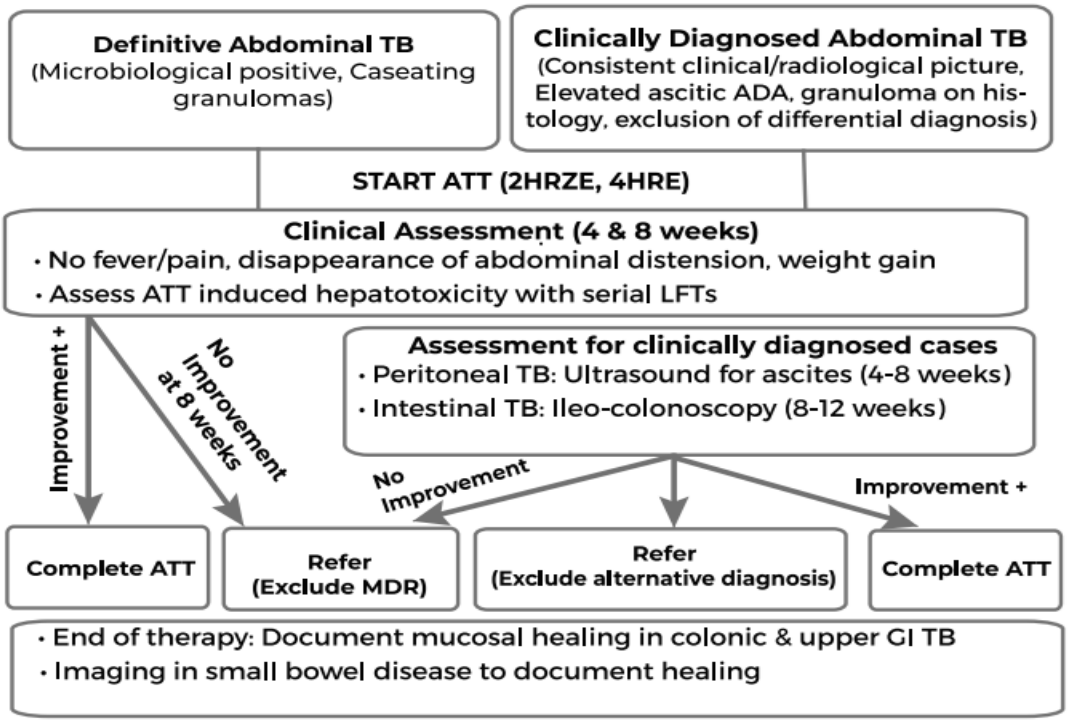
- Provide comprehensive patient support throughout the entire treatment process.
- Redesign and pursue targeted active case-finding strategies to detect TB in at-risk populations.
- Implement ambitious plans for TB preventive treatment among household contacts, children, people living with HIV (PLHIV), and other locally defined high-risk groups using new, shorter treatment regimens.

**Newer TB Drugs**

The development of new drugs to treat tuberculosis (TB) is making significant progress.

Two new drugs, **Bedaquiline (Bdq)** and **Delamanid**, have been introduced, offering new options for treating drug-resistant TB. However, further innovation and the development of additional TB drugs are crucial to effectively combat the disease and address the growing challenge of drug resistance

**FOLLOW-UP[64]**


Definitive Abdominal TB
(Microbiological positive, Caseating granulomas)
Clinically Diagnosed Abdominal TB
(Consistent clinical/radiological picture, Elevated ascitic ADA, granuloma on histology, exclusion of differential diagnosis)
START ATT (2HRZE, 4HRE)
Clinical Assessment (4 & 8 weeks)
• No fever/pain, disappearance of abdominal distension, weight gain
• Assess ATT induced hepatotoxicity with serial LFTs
Improvement +
No Improvement at 8 weeks
Assessment for clinically diagnosed cases
• Peritoneal TB: Ultrasound for ascites (4-8 weeks)
• Intestinal TB: Ileo-colonoscopy (8-12 weeks)
No Improvement
Improvement +
Complete ATT
Refer (Exclude MDR)
Refer (Exclude alternative diagnosis)
Complete ATT
• End of therapy: Document mucosal healing in colonic & upper GI TB
• Imaging in small bowel disease to document healing

*Abbreviations: TB: Tuberculosis, ADA: Adenosine Daeminase, H: Isoniazid, R: Rifampicin, Z: Pyrazinamide, E: Ethambutol, LFT: Liver Function Test, ATT: Atnti-Tubercular treatment, MDR: Multi-drug resistance, GI TB: Gastrointestinal Tuberculosis*

**Indications for Corticosteroid Use in Abdominal TB:**

- **Peritoneal TB:** Corticosteroids can be used to reduce severe peritoneal inflammation and adhesion formation.
- **Intestinal Obstruction:** In cases where abdominal TB causes significant inflammation leading to intestinal obstruction, corticosteroids may help reduce the inflammatory mass and avoid surgical intervention.[94]
- **Tuberculous Peritonitis:** Steroids can reduce ascites and inflammation, preventing adhesions and bowel obstruction.
- **Complications such as Perforation or Severe Inflammation:** In such cases, corticosteroids may be considered to control inflammation, particularly if surgery is not immediately feasible.

**II). Surgical Management:**

Recent studies indicate that routine antitubercular chemotherapy for 6 months is effective in treating patients with abdominal tuberculosis (TB).**[113]** Approximately 85% of cases of intestinal TB can be successfully managed with medical treatment alone, with surgical intervention indicated in only 15% of cases due to complications such as perforation, obstruction, bleeding, or abscess formation.**[114]**

Notably, about 20% to 40% of patients with abdominal TB present with an acute abdomen, necessitating emergency surgical intervention.**[115]**

In cases of **subacute obstruction**, patients can often be managed conservatively initially, with surgery planned electively as needed.

**Surgical intervention** may be necessary in certain cases of abdominal TB, particularly when complications arise or when conservative medical treatment is insufficient. The following outlines the indications, types of surgical procedures, and considerations involved in the surgical management of abdominal TB.

**Indications for Surgery:**

- **Intestinal Obstruction:** Surgical intervention may be required in cases of significant bowel obstruction due to inflammatory masses, strictures, or adhesions.
- **Perforation:** If there is perforation of the intestine or any intra-abdominal abscess formation, surgical repair or drainage is essential.
- **Abscess Drainage:** In cases of large intra-abdominal or retroperitoneal abscesses, drainage may be necessary.
- Strictures or Fistulas: Surgical correction may be indicated for symptomatic strictures or intestinal fistulas that do not respond to medical management.
- **Failure of Medical Therapy:** If the patient does not improve with anti-TB treatment or experiences recurrent complications, surgical intervention may be warranted.

**Types of Surgical Procedures:**

- **Resection and anastomosis:** Resection of the affected segment of the intestine may be necessary in cases of strictures or extensive disease. This may involve:
- **Ileocecectomy:** Removal of the ileocecal region, common in ileocecal TB.
- **Small Bowel Resection:** Resection of the involved segment of the small intestine.
- **Bowel Bypass:** In cases where resection is not feasible, bypass procedures may be performed to alleviate obstruction.
- **Abscess Drainage:** Percutaneous or surgical drainage of intra-abdominal abscesses may be required to relieve symptoms and prevent complications.
- **Fistula Repair:** Surgical intervention may be necessary to repair intestinal fistulas resulting from TB.

# *MATERIAL AND METHODS*

# MATERIALS AND METHODS

**Study place:** Department of General Surgery, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh.

**Duration of Study:** 18 Months (July 2023 to January 2025)

**Study Design:** Hospital based observational study

**Study population:** Patients admitted with confirmed diagnosis of Subacute Intestinal Obstruction under Department of General Surgery, Santosh Medical College and Hospital, Ghaziabad

**Sample Size:** 87

Sample size is calculated using the formula

$$n = deff \times \frac{N\hat{p}\hat{q}}{\frac{d^2}{1.96^2}(N-1) + \hat{p}\hat{q}}$$

The notations for the formulae are:

$n$ = sample size
$deff$ = design effect
$N$ = population size
$\hat{p}$ = the estimated proportion
$\hat{q} = 1 - \hat{p}$
$d$ = desired absolute precision or absolute level of precision

## STATISTICAL ANALYSIS

Data **was recorded** on a predesigned Performa and **managed** on an Excel spreadsheet .

Categorical variables **were summarized** by frequency (%), while quantitative variables **were summarized** by mean ± standard deviation. **Stata MP-17 statistical software was used** for data analysis. In this study, **$p < 0.05$ was considered** statistically significant.

**Inclusion Criteria:**

- Patient with Subacute Intestinal Obstruction
- Patient with Intestinal Tuberculosis
- Patient of Subacute Intestinal Obstruction with Contact history of Tuberculosis
- Patient of Subacute Intestinal Obstruction With Past History Of Pulmonary or Extra Pulmonary Tuberculosis
- Age 18-75 years
- Gender- both males and females

**Exclusion Criteria:**

- Patient refusal to participate
- Patients less than 18 years and more than 75 years

**METHODOLOGY:**

This hospital-based, prospective observational study was conducted in the Department of General Surgery at Santosh Medical College & Hospital from July 2023 to January 2025. The study included a total of 87 patients diagnosed with subacute intestinal obstruction.

All patients underwent a comprehensive clinical examination following a detailed medical history assessment. The diagnosis of subacute intestinal obstruction was established based on the patient's history and physical examination. Additionally, all relevant investigations were conducted to confirm the diagnosis and assess the patient's condition.

Based on clinical history, including a known diagnosis of tuberculosis, past history of tuberculosis, or a history of contact with tuberculosis patients, patients were categorized as suspected cases. Further evaluations were then conducted accordingly.

Significant weight loss, evening rise in temperature, persistent cough for more than two weeks, and loss of appetite were considered key clinical indicators for suspecting tuberculosis, including intestinal tuberculosis.

In some cases, even in the absence of a documented history of tuberculosis or known contact with tuberculosis patients, the diagnosis was suspected based on investigative findings. These included hematological tests, sputum analysis for acid-fast bacilli (AFB), ultrasonography (USG) to assess abdominal pathology, and other radiological investigations such as X-rays and CT scans. These diagnostic modalities played a crucial role in identifying potential tuberculosis-related intestinal obstruction.

The following investigative findings were considered indicative of suspected intestinal tuberculosis:

**Hematological tests:** Erythrocyte sedimentation rate (ESR) and the Mantoux test have low specificity but when correlated with a positive clinical history and supportive findings from other investigations, they contributed to the suspicion of intestinal tuberculosis.

Serum Acid-Fast Bacillus (AFB) test and TB-Gold assay are highly specific blood investigations used to support the diagnosis of tuberculosis.

**Sputum analysis:** Acid-Fast Bacillus (AFB) and Cartridge-Based Nucleic Acid Amplification Test (CBNAAT) are highly specific diagnostic tests for detecting tuberculosis.

**Radiological Investigations:**

**X-Rays:** Findings such as prominent bronchovascular markings, nodular opacities, cavitary lesions, miliary nodules, pleural thickening, pleural effusion, and mediastinal or hilar lymphadenopathy on **chest X-ray** are suggestive of suspected active pulmonary tuberculosis.

Findings such as the thumbprinting sign, calcified lymph nodes, thickened valvulae conniventes, and the 'string of beads' appearance on an **abdominal X**-ray are suggestive of suspected active abdominal tuberculosis.

**Abdominal Ultrasonography (USG):** Findings such as mesenteric lymphadenopathy, bowel wall thickening, ascites, thickened mesentery, omental thickening, peritoneal thickening, and a pulled-up cecum on abdominal ultrasonography (USG) are suggestive of suspected active abdominal tuberculosis.

**Abdominal CT scan:** Findings such as ascites, peritoneal thickening, omental thickening, enlarged mesenteric lymphadenopathy, ileocecal thickening, other bowel wall thickening, fibrotic strictures, matted bowel loops, calcified lymph nodes, and a pulled-up cecum on abdominal CT are suggestive of suspected abdominal tuberculosis.

**Colonoscopy**: Findings such as ulcerative lesions, hypertrophic lesions, fibrostenotic strictures, ileocecal thickening, nodular or granulomatous lesions, and fistulae are suggestive of suspected abdominal tuberculosis.

**Barium study:** Findings on a barium study, including ileocecal region involvement, mucosal and ulcerative changes, strictures leading to bowel obstruction, adhesions, and fistulae, are suggestive of suspected abdominal tuberculosis.

All patients, including both suspected and non-suspected cases, were initially managed conservatively. Except for a few cases, the majority were successfully treated with conservative management, particularly those suspected of having intestinal tuberculosis.

For patients suspected of having intestinal tuberculosis, anti-tubercular therapy (ATT) was initiated as per the Directly Observed Treatment, Short-course (DOTS) regimen. These patients were closely monitored and followed up for a duration of 2 to 6 months to assess their clinical response, treatment adherence, and any potential complications.

# *RESULTS AND ANALYSIS*

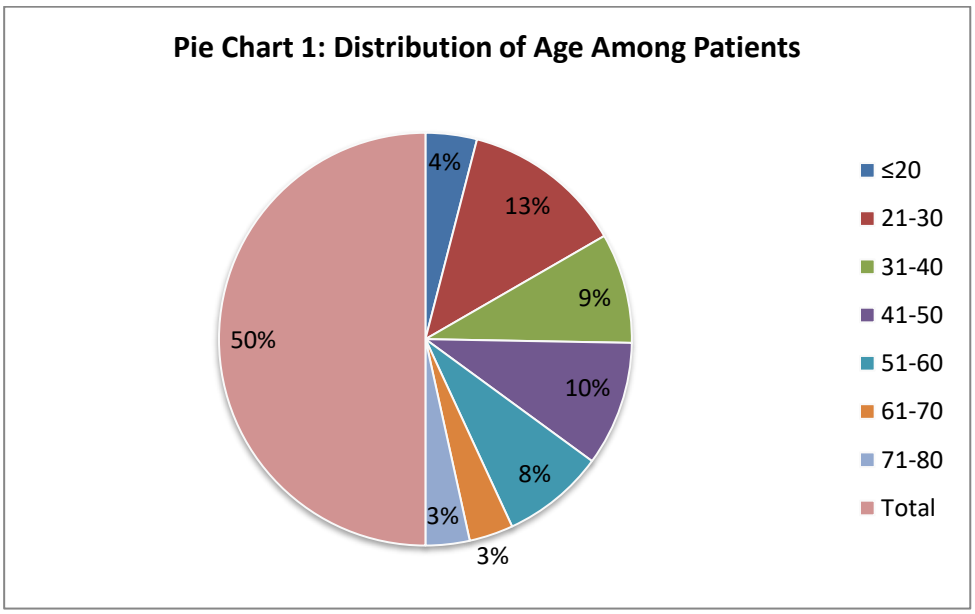
# RESULTS AND ANALYSIS

**Age Incidence:**

"In this study, the age of patients ranged from 18 to 75 years. Table 1 presents the age distribution across various age groups. The mean age in this cohort was 41.75 years. The majority of cases (74%) were concentrated in the second, third, and fourth decades of life. Chart 1 illustrates the age distribution observed in this study."

**Table No. 1 Distribution of Age Among Patients**

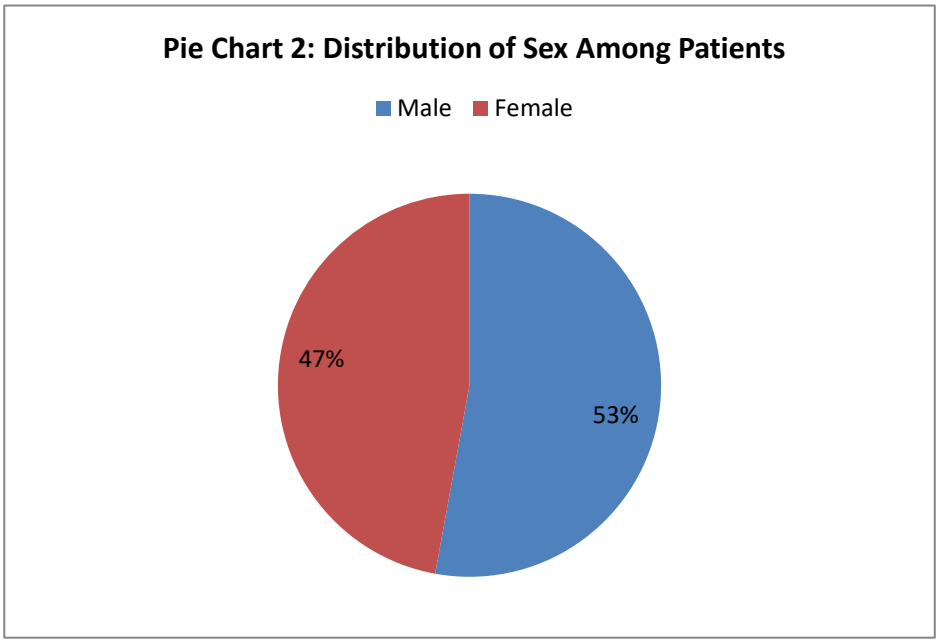
| Age Groups | Number of Patients | Percentage |
|---|---|---|
| ≤20 | 7 | 8 |
| 21-30 | 22 | 25.3 |
| 31-40 | 15 | 17.2 |
| 41-50 | 17 | 19.5 |
| 51-60 | 14 | 16.1 |
| 61-70 | 6 | 6.9 |
| 71-80 | 6 | 6.8 |
| **Total** | **87** | **100** |



**Sex Incidence:**

**Table No. 2 Distribution of Sex Among Patients**

| Sex | Number | Percentage% |
|---|---|---|
| Male | 46 | 53 |
| Female | 41 | 47 |




In the present series of 87 cases, 53% of the patients were male, while the remaining 47% were female. No significant age difference was observed between males and females. Table 2 and Chart 2 present the sex distribution in this series.

**Socioeconomic Status:**

In the present study, except six patients all 81 belonged to the lower socioeconomic status of society.

**History of pulmonary Tuberculosis:**

In the present series, two cases had a history of pulmonary tuberculosis. One patient was undergoing treatment at the time of presentation with abdominal tuberculosis, while the other had discontinued treatment prematurely.

**Disease Manifestations:**

The duration of symptoms in this study ranged from one day to several months. Approximately 56% of patients experienced one or more symptoms for more than three months. Table 3 presents the most commonly encountered symptoms in this series.

Abdominal pain was the most frequent presenting complaint, reported in 94% of cases. Lower abdominal pain was the most common, followed by periumbilical pain. In most cases, the pain was described as colicky in nature.

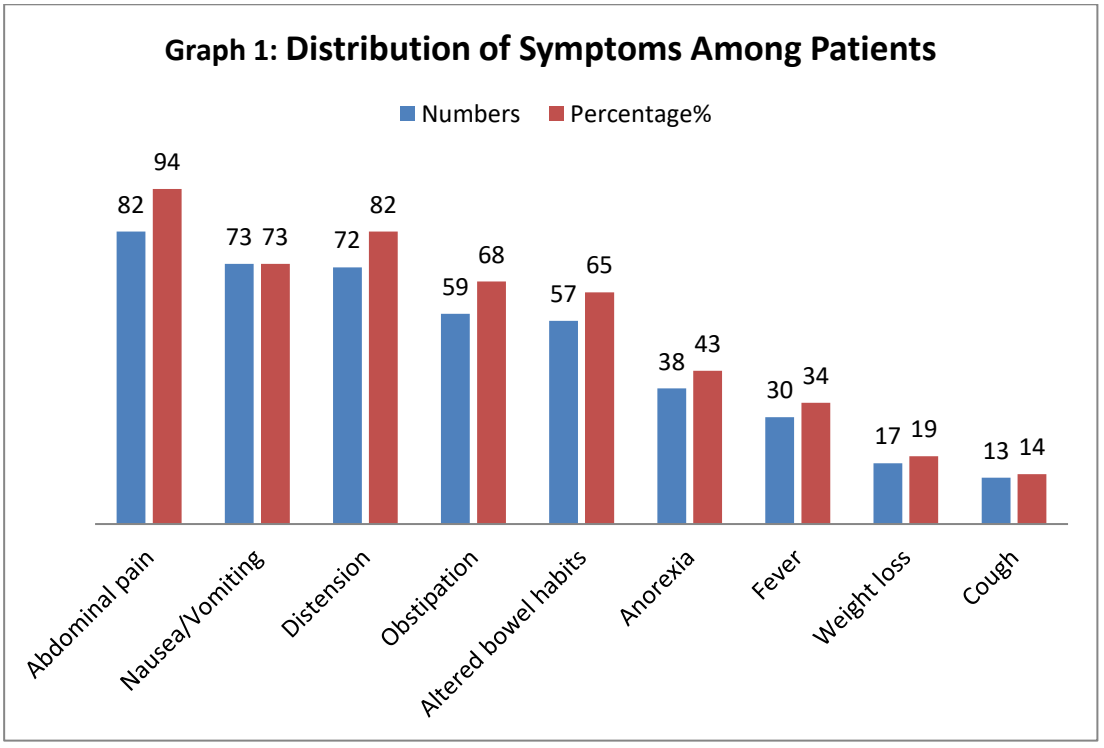
Other prevalent symptoms included vomiting, observed in 84% of patients, with most experiencing pain relief after vomiting. Altered bowel habits, particularly constipation or obstipation, were noted in 59% of cases. Fever was present in 34% of patients, typically mild to moderate, with an evening rise in temperature.

Abdominal distension was a presenting complaint in 83% of cases, primarily generalized or localized to the lower abdomen. Additionally, anorexia was reported in 43% of cases, while weight loss was observed in 19.5%. The majority of these cases involved subacute intestinal obstruction with symptoms persisting for several months.

The following Graph-1 illustrates the most common symptoms in this study

**Table No.3: Distribution of Symptoms Among Patients**

| Symptoms | Numbers | Percentage% |
|---|---|---|
| Abdominal pain | 82 | 94 |
| Nausea/Vomiting | 73 | 73 |
| Distension | 72 | 82 |
| Obstipation | 59 | 68 |
| Altered bowel habits | 57 | 65 |
| Anorexia | 38 | 43 |
| Fever | 30 | 34 |
| Weight loss | 17 | 19 |
| Cough | 13 | 14 |



**Physical Findings:**

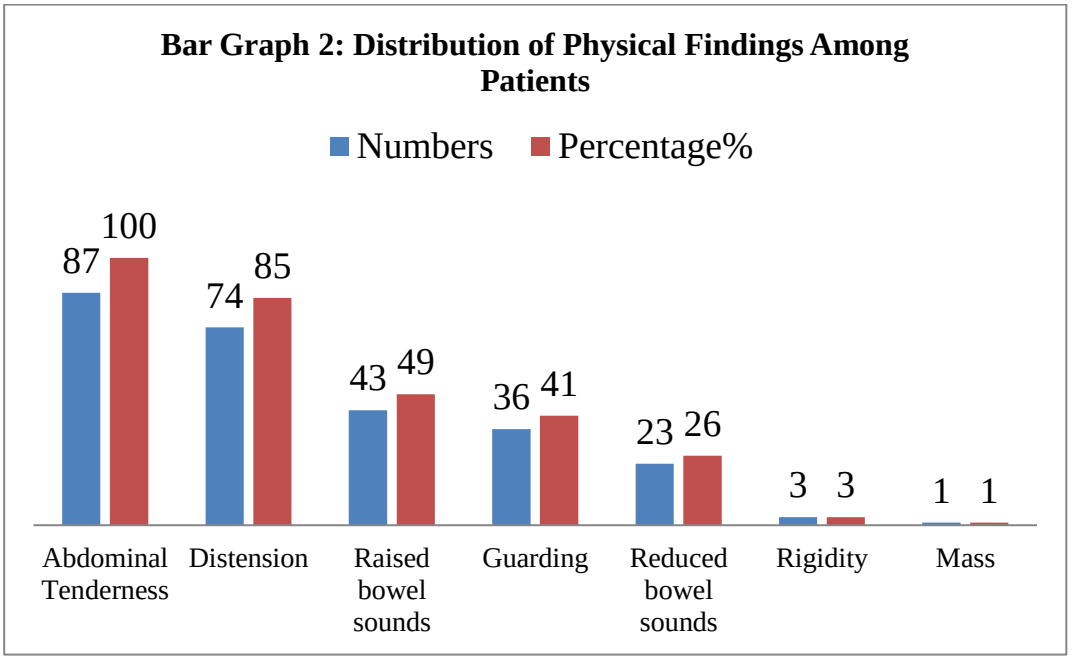
As shown in Table 4 and Graph 2, abdominal tenderness was the most common clinical finding, observed in 100% of cases. Rigidity was present in 3% of cases, all of which were associated with perforative peritonitis. Abdominal distension was noted in 85% of cases, while guarding was observed in 41%.

A palpable mass was identified in 1% of cases, predominantly in the right iliac fossa, with a single case located in the right lumbar region.

Hypoperistalsis, characterized by reduced bowel sounds, was detected in 49% of cases, while exaggerated bowel sounds were present in 26%.

**Table no.4: Distribution of Physical Findings Among Patients**

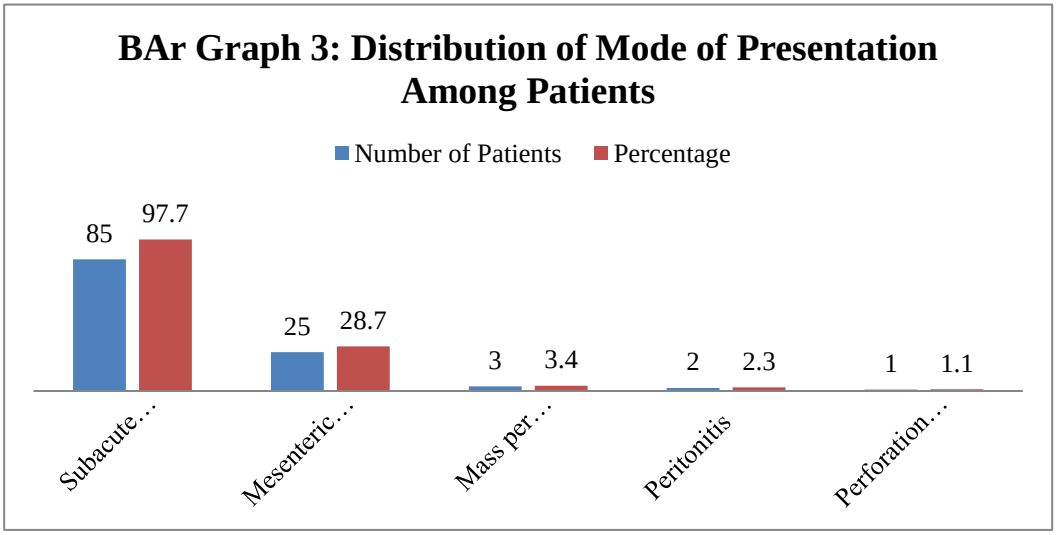
| Signs | Numbers | Percentage% |
|---|---|---|
| Abdominal Tenderness | 87 | 100 |
| Distension | 74 | 85 |
| Raised Bowel sounds | 43 | 49 |
| Guarding | 36 | 41 |
| Reduced Bowel sounds | 23 | 26 |
| Rigidity | 3 | 3 |
| Mass | 1 | 1 |



**Mode of Presentation:**

**Table No. 5: Distribution of Mode of Presentation Among Patients**

| Clinical diagnosis | Number of Patients | Percentage |
|---|---|---|
| Subacute Intestinal Obstruction(SAIO) | 85 | 97.7 |
| Mesenteric Lymphadenitis | 25 | 28.7 |
| Mass per abdomen | 3 | 3.4 |
| Peritonitis | 2 | 2.3 |
| Perforation peritonitis | 1 | 1.1 |




The Bar graph 3 represents the clinical diagnosis of Eighty seven patients based on their presenting conditions. It highlights the frequency and percentage of various diagnoses, showing the distribution of cases among different conditions. The key observations from the graph are as follows:

1. Subacute Intestinal Obstruction (SAIO) – 85 cases (97.7%)
2. Mesenteric Lymphadenitis – 25 cases (28.7%)
3. Mass per Abdomen – 3 cases (3.4%)
4. Peritonitis – 2 cases (2.3%)
5. Perforation Peritonitis – 1 case (1.1%)

**Tuberculosis Contact History:**

**Table No. 6: Distribution of Tuberculosis Contact History Among Patients**

| Tuberculosis Contact History | Number of Patients | Percentage |
|---|---|---|
| Yes | 13 | 14.9 |
| No | 74 | 85.1 |

The majority (85.1%) of patients reported no known TB contact, suggesting that most cases may have developed TB through unknown sources or endogenous reactivation.

Only 14.9% of patients had a positive contact history, indicating direct exposure to a TB-positive case.

**Known case of Tuberculosis:**

**Table No. 7: Distribution of Known case of Tuberculosis Among Patients**

| Known case of Tuberculosis | Number of Patients | Percentage |
|---|---|---|
| Yes | 2 | 2.3 |
| No | 85 | 97.7 |

Most patients (97.7%) had no known history of TB, indicating that they were either newly diagnosed or had never been evaluated for TB before.

Only 2.3% of patients had a prior TB diagnosis, suggesting that a very small fraction of this population had documented TB treatment or recurrence.

**Investigations**

**Blood investigations:**

**Haemoglobin:** The majority of patients (83.9%) have haemoglobin levels in the 10-14+ g/dL range, which is within or near the normal reference range for most individuals.

A smaller proportion (16.1%) of patients have haemoglobin levels between 5-10 g/dL, suggesting the presence of mild to moderate anemia.

**Erythrocyte Sedimentation Rate (ESR):**

**Table No. 8: Distribution of Erythrocyte Sedimentation Rate (ESR) Among Patients**

| ESR | Number of Patients | Percentage |
|---|---|---|
| 0-15 | 34 | 39.1 |
| 16-20 | 25 | 28.7 |
| 21-30 | 9 | 10.3 |
| >30 | 19 | 21.8 |

The table no. 6 represents the distribution of Erythrocyte Sedimentation Rate (ESR) levels among 87 patients, divided into four categories:

39.1% of patients have ESR levels in the normal range (0-15 mm/hr), suggesting no significant inflammation.

28.7% have mildly elevated ESR (15-20 mm/hr), which may indicate mild inflammation or infection.

10.3% have ESR levels between 21-30 mm/hr, reflecting moderate inflammation.

21.8% have ESR levels above 30 mm/hr, which may indicate chronic inflammation like Tuberculosis, infection, or autoimmune conditions.

**Montaux Test:**

**Table no. 9: Distribution of Montaux Test Among Patients**

| Montaux | Number of Patients | Percentage |
|---|---|---|
| Negative | 55 | 63.2 |
| Positive | 24 | 27.6 |
| Not available | 8 | 9.2 |

- 63.2% of patients had a negative Montaux test, indicating no significant exposure to Mycobacterium tuberculosis or an immunocompromised state where the test fails to elicit a response.
- 27.6% of patients tested positive, suggesting previous exposure to tuberculosis (TB) or an active TB infection.
- 9.2% of cases did not have Montaux test results available, which may indicate unperformed tests.

**Serum AFB:**

**Table no. 10: Distribution of Serum AFB Among Patients**

| Serum AFB | Number of Patients | Percentage |
|---|---|---|
| Positive | 1 | 1.1 |
| Negative | 6 | 6.9 |
| Not available | 80 | 92 |

92% of cases do not have available Serum AFB results, indicating that the test was not performed for the majority of patients.

A small number of patients tested negative, suggesting no detectable AFB in their serum.

Only a minimal percentage tested positive, indicating confirmed systemic mycobacterial infection in very few individuals.

**Sputum AFB:**

**Table no. 11: Distribution of Sputum AFB Among Patients**

| Sputum AFB | Number of Patients | Percentage |
|---|---|---|
| Positive | 2 | 2.3 |
| Negative | 19 | 21.8 |
| Not available | 66 | 75.9 |

21.8% of patients tested negative, indicating no detectable mycobacteria in their sputum samples.

A very small percentage tested positive, confirming the presence of pulmonary tuberculosis (TB) in those cases.

75.9% of cases lack sputum AFB results, suggesting that the test was either not performed or not recorded for most patients.

**CBNAAT:**

**Table no. 12: Distribution of CBNAAT Among Patients**

| CBNAAT | Number of Patients | Percentage |
|---|---|---|
| Positive | 1 | 1.2 |
| Negative | 6 | 5.7 |
| Not available | 81 | 93.1 |

5.7% of patients tested negative, confirming the absence of detectable Mycobacterium tuberculosis DNA in their samples.

A very small percentage tested positive, indicating confirmed tubercular infection in those cases.

93.1% of cases lack CBNAAT results, indicating that the test was not performed or not recorded for most patients.

**TB-Gold:**

**Table no. 13: Distribution of TB-Gold Among Patients**

| TB-Gold | Number of Patients | Percentage |
|---|---|---|
| Positive | 1 | 1.1 |
| Negative | 0 | 0 |
| Not available | 86 | 98.9 |

A very small percentage tested positive, indicating confirmed latent or active TB infection in those cases.

The absence of notable negative cases suggests that very few patients underwent TB-Gold

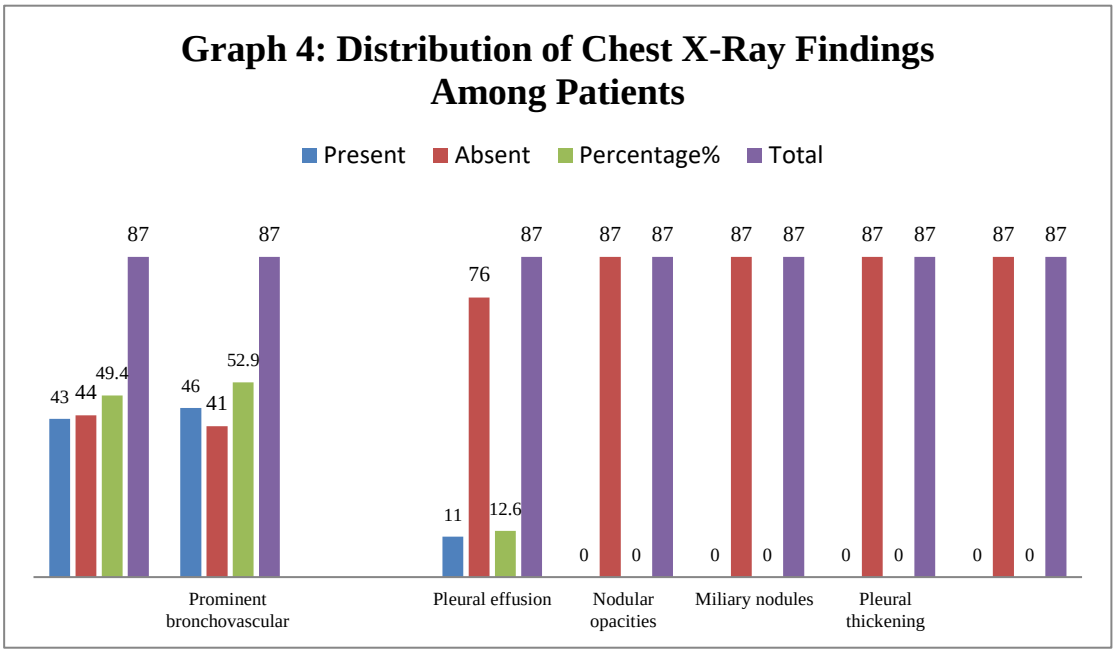
testing.

98.9% of cases lack TB-Gold results, indicating that the test was rarely performed or documented for this patient group.

**Chest X-Ray:**

**Table no. 14: Distribution of Chest X-Ray Findings Among Patients**

| Chest X-Ray Findings | Present | Absent | Percentage% | Total |
|---|---|---|---|---|
| Normal Findings | 43 | 44 | 49.4 | 87 |
| Prominent bronchovascular markings | 46 | 41 | 52.9 | 87 |
| Pleural effusion | 10 | 77 | 11.49 | 87 |
| Nodular opacities | 0 | 87 | 0 | 87 |
| Miliary nodules | 0 | 87 | 0 | 87 |
| Pleural thickening | 0 | 87 | 0 | 87 |
| Hilar lymphadenopathy | 0 | 87 | 0 | 87 |




The bar chart presents the chest X-ray findings among 87 patients, categorized into different radiological abnormalities and normal findings.

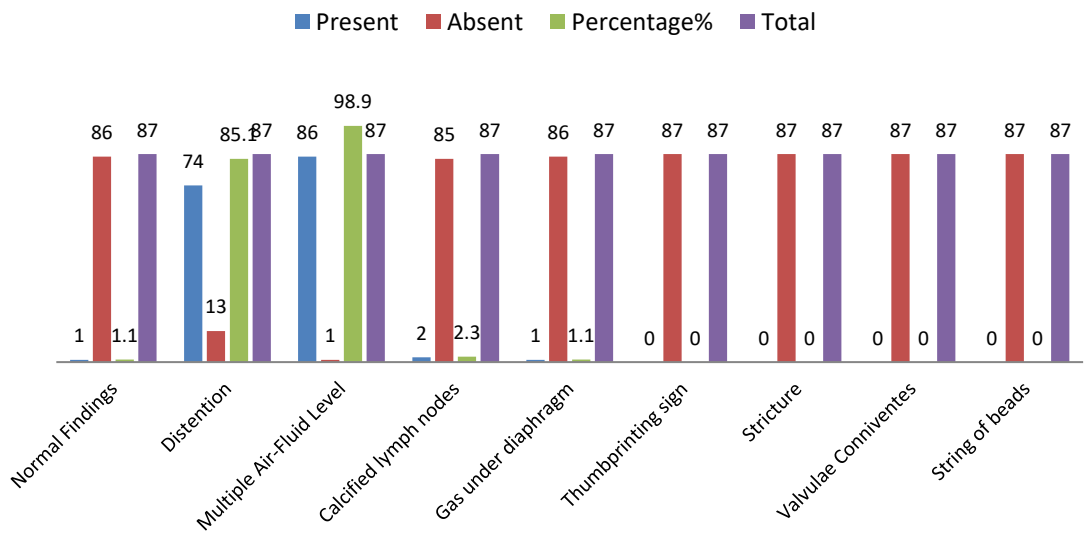
1. Normal Findings 43 (49.4%)
2. Prominent Bronchovascular Markings 48 (52.8%)
3. Pleural Effusion 10 (11.49%)
4. No Findings of Active or Advanced TB (0%)

**X-Ray Abdomen (Erect):**

**Table no. 14: Distribution of X-Ray Abdomen (Erect) Findings Among Patients**

| Findings | Present | Absent | Percentage% | Total |
|---|---|---|---|---|
| Normal Findings | 1 | 86 | 1.1 | 87 |
| Distention | 74 | 13 | 85.1 | 87 |
| Multiple Air-Fluid Level | 86 | 1 | 98.9 | 87 |
| Calcified lymph nodes | 2 | 85 | 2.3 | 87 |
| Gas under diaphragm | 1 | 86 | 1.1 | 87 |
| Thumbprinting sign | 0 | 87 | 0 | 87 |
| Stricture | 0 | 87 | 0 | 87 |
| Valvulae Conniventes | 0 | 87 | 0 | 87 |
| String of beads | 0 | 87 | 0 | 87 |

**Graph 5: Distribution of X-Ray Abdomen (Erect) Findings Among Patients**



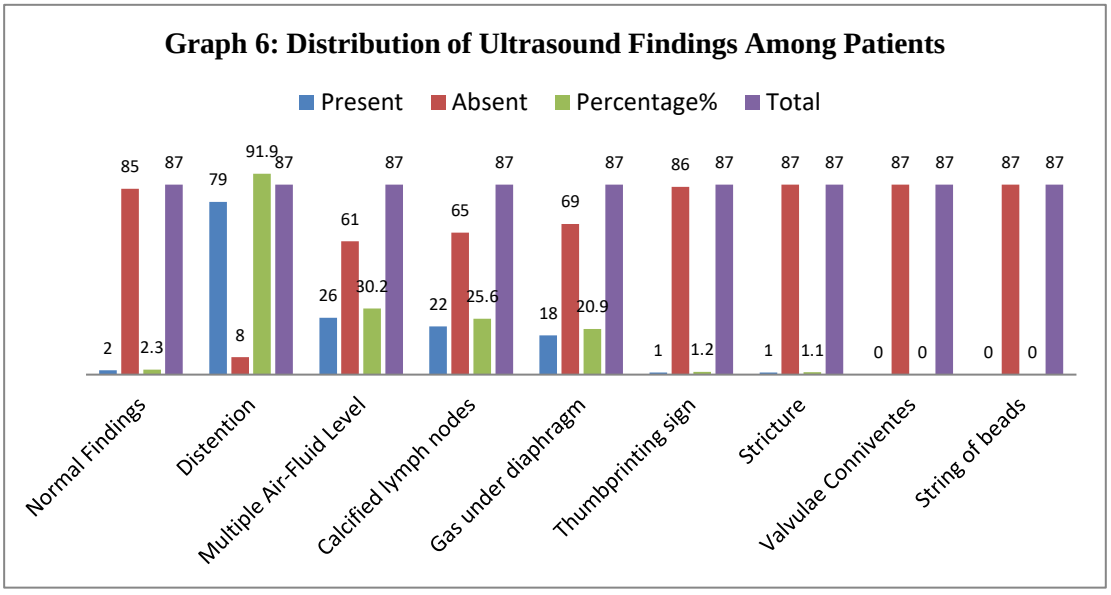
This chart presents the abdominal X-ray (erect) findings for 87 patients, highlighting abnormalities that may indicate gastrointestinal pathology, including intestinal obstruction and tuberculosis-related complications.

1. Multiple Air-Fluid Levels (88.9%)
2. Distention (85.1%)
3. Normal Findings (1.1%).
4. Calcified Lymph Nodes (2.3%)
5. Absence of Other Classic TB Signs

**Ultrasound Findings:**

**Table no. 15: Distribution of Ultrasound Findings Among Patients**

| Findings | Present | Absent | Percentage% | Total |
|---|---|---|---|---|
| Normal Findings | 2 | 85 | 2.3 | 87 |
| Distention | 79 | 8 | 91.9 | 87 |
| Multiple Air-Fluid Level | 26 | 61 | 30.2 | 87 |
| Calcified lymph nodes | 22 | 65 | 25.6 | 87 |
| Gas under diaphragm | 18 | 69 | 20.9 | 87 |
| Thumbprinting sign | 1 | 86 | 1.2 | 87 |
| Stricture | 1 | 87 | 1.1 | 87 |
| Valvulae Conniventes | 0 | 87 | 0 | 87 |
| String of beads | 0 | 87 | 0 | 87 |



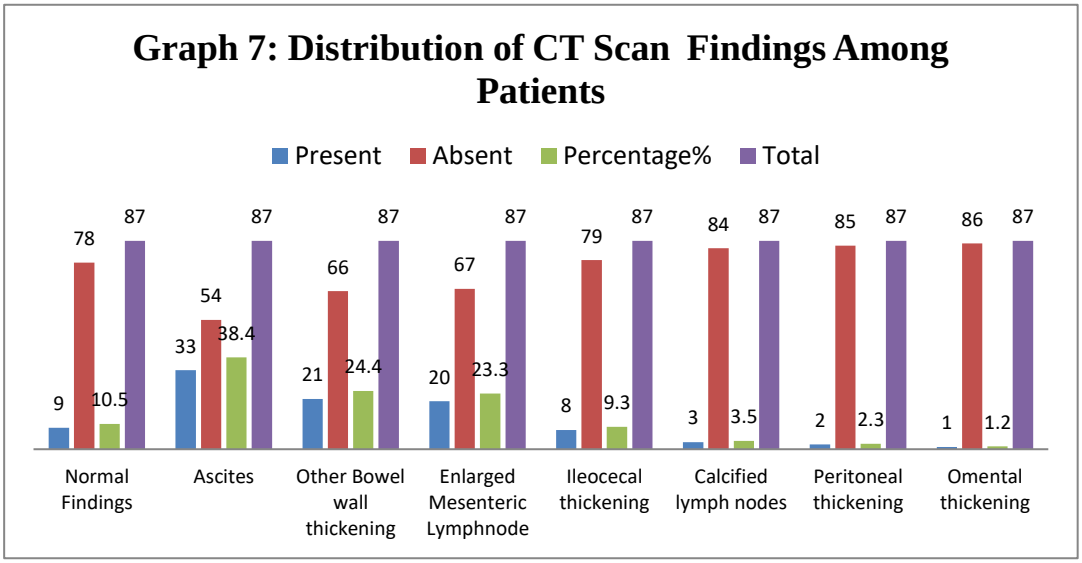
This Graph 6 presents the ultrasound findings for 87 patients, focusing on gastrointestinal and peritoneal abnormalities, many of which could be associated with intestinal tuberculosis, obstruction, or other intra-abdominal pathologies.

1. Dilated Bowel Loops 79 (91.9%)
2. Ascites 26 (30.2%)
3. Mesenteric Lymphadenopathy 22 (25.6%)
4. Bowel Wall Thickening 18 (20.9%)
5. Omental Thickening 1(1.2%)
6. Normal Findings 1(1.2%)
7. Absence of Certain Features

**CT-Scan Findings:**

**Table no. 16: Distribution of CT Scan Findings Among Patients**

| Findings | Number of Patients | Percentage |
|---|---|---|
| Normal Findings | 9 | 10.5 |
| Ascites | 33 | 38.4 |
| Other Bowel wall thickening | 21 | 24.4 |
| Enlarged Mesenteric Lymphnode | 20 | 23.3 |
| Ileocecal thickening | 8 | 9.3 |
| Calcified lymph nodes | 3 | 3.5 |
| Peritoneal thickening | 2 | 2.3 |
| Omental thickening | 1 | 1.2 |



This bar Graph presents CT-scan findings in 87 patients, likely investigated for abdominal tuberculosis (TB) or related conditions.

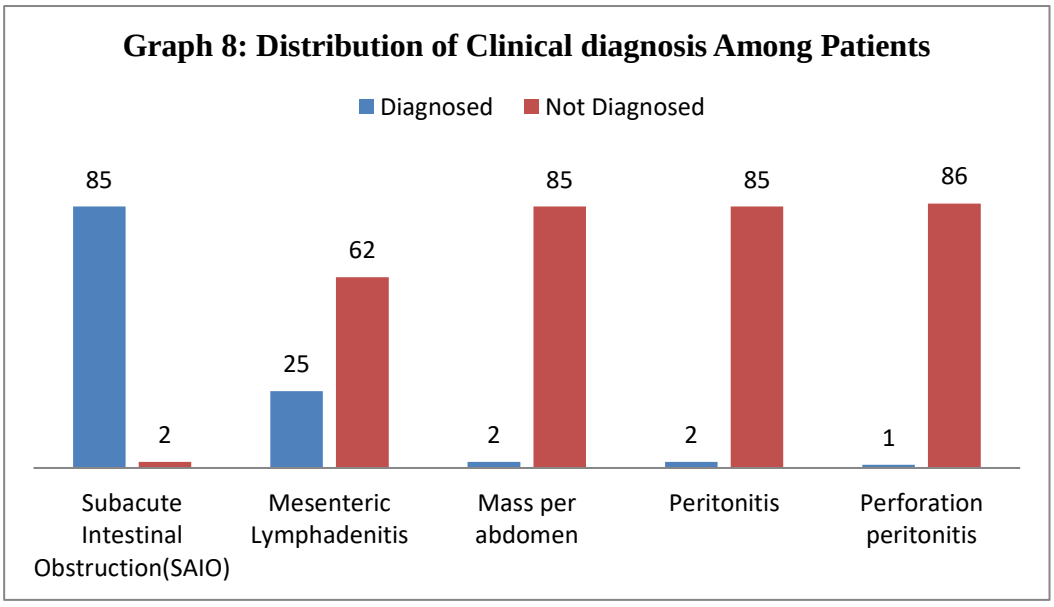
1. Ascites 33(38.4%)
2. Enlarged Mesenteric Lymph Nodes 20 (23.3%)
3. Other Bowel Wall Thickening 21(24.4%)
4. Ileocecal Thickening 8 (9.3%)
5. Calcified Lymph Nodes 3 (3.5%)
6. Peritoneal Thickening 2 (2.3%) & Omental Thickening 1 (1.2%)
7. Normal Findings 9 (10.5%)
8. Not Available (43%)

**Clinical diagnosis:**

**Table no. 17: Distribution of Clinical diagnosis Among Patients**

| Clinical diagnosis | Diagnosed | Not Diagnosed as | Percentage |
|---|---|---|---|
| Subacute Intestinal Obstruction(SAIO) | 85 | 2 | 97.7 |
| Mesenteric Lymphadenitis | 25 | 62 | 28.7 |
| Mass per abdomen | 2 | 85 | 2.3 |
| Peritonitis | 2 | 85 | 2.3 |
| Perforation peritonitis | 1 | 86 | 1.1 |

**Graph 8: Distribution of Clinical diagnosis Among Patients**



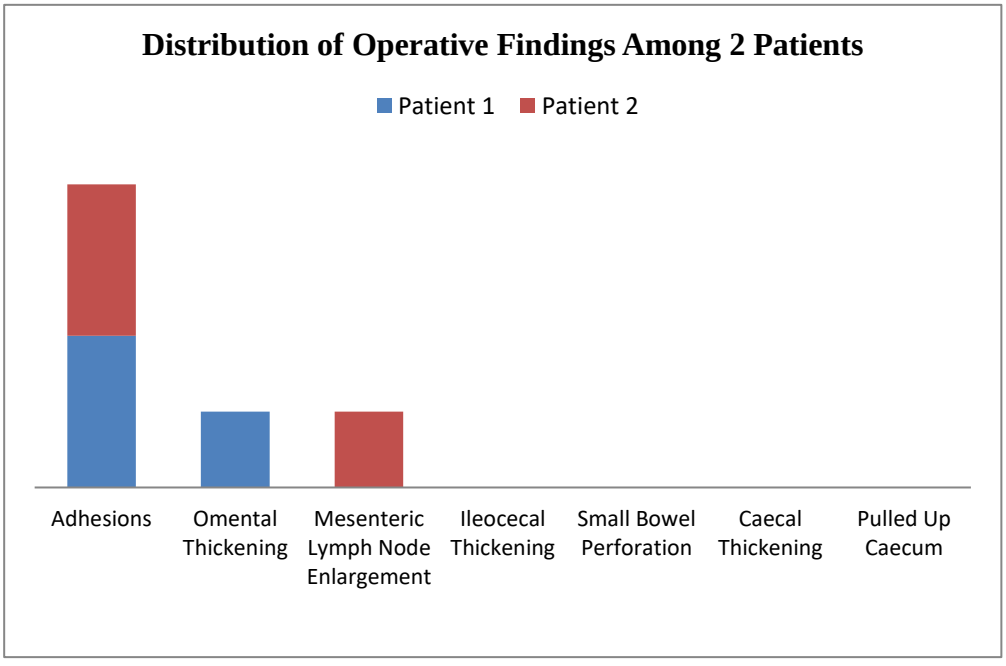
This chart presents clinical diagnoses among 87 patients, with a strong indication of abdominal tuberculosis (TB) as a potential cause.

1. Subacute Intestinal Obstruction (SAIO) - 97.7% (85 patients).
2. Mass Per Abdomen – 2.3% (2 patients)
3. Peritonitis - 2.3% (2 patients)
4. Perforation Peritonitis - 1.1% (1 patient

**Operative Findings:**

**Table no. 18: Distribution of Operative Findings Among 2 Patients**

| Operative Findings | Patient 1 | Patient 2 |
|---|---|---|
| Adhesions | Present | Present |
| Omental Thickening | Present | Absent |
| Mesenteric Lymph Node Enlargement | Absent | Present |
| Ileocecal Thickening | Absent | Absent |
| Small Bowel Perforation | Absent | Absent |
| Caecal Thickening | Absent | Absent |
| Pulled Up Caecum | Absent | Absent |



Out of the total 87 patients in this study, only 2 patients (2.3%) required surgical intervention due to the necessity for surgical exploration, as explained in the Table no. 18. The majority of patients (97.7%) did not undergo surgery, as indicated by the "Not applicable" category.

The surgical decision was based on clinical indications that warranted operative management. According to the graph, adhesions were found in 2 patients (2.3%), while additional intraoperative findings included omental thickening (1.1%) and enlarged mesenteric lymph nodes (1.1%). However, cases of ileocecal (1.1%), strictures, small bowel perforation (1.1%), and no case of pulled-up cecum were reported.

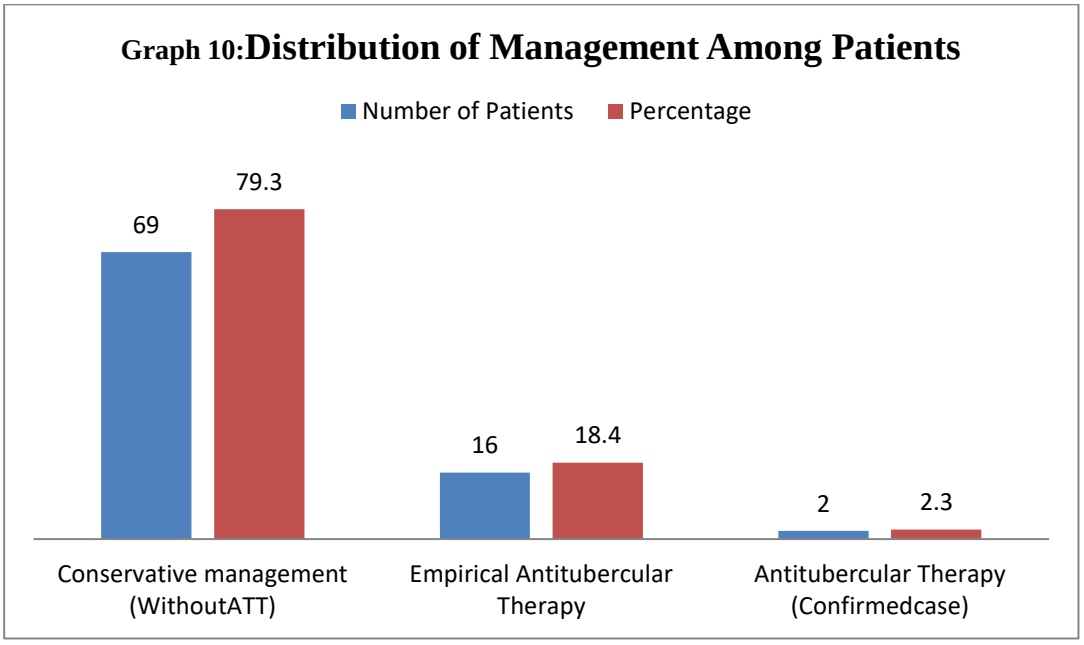
**Intra-Op Findings:** Out of the 87 patients, surgical intervention was performed on 2 individuals due to the necessity for surgical exploration and Intra-Op findings are follow:

- A significant majority, 97.7% of the cases, were classified as "Not performed," indicating that surgical intervention was not required.
- 2.3% (2 patients) were categorized as "Tubercular," suggesting that tuberculosis was the underlying pathology in those who required surgery.

**Management:**

**Table no. 19: Distribution of Management Among Patients**

| Management | Number of Patients | Percentage% |
|---|---|---|
| Conservative management (WithoutATT) | 69 | 79.3 |
| Empirical Antitubercular Therapy | 16 | 18.4 |
| Antitubercular Therapy (Confirmed case) | 2 | 2.3 |




The "Responded to" Table no. 19 and Graph-10 presents the treatment response of 87 patients, classified into three distinct management approaches:

1. Conservative Management (Without ATT) – 69 (79.3%) of Patients
2. Empirical Antitubercular Therapy (ATT) – 16 (18.4%) of Patients
3. Antitubercular Therapy (Confirmed Case) – Minority of Patients 2 (2.3%)

# *DISCUSSION*

# DISCUSSION

The present observational study was conducted at Santosh Medical College & Hospital, Ghaziabad, over a period of one and a half years (July 2023 to January 2025).

The study was aimed to evaluate the prevalence of abdominal tuberculosis in patients with subacute intestinal obstruction (SAIO). The collected data was analyzed and systematically compared with existing studies on similar topics after comprehensive research, with the findings outlined below.

**Age Distribution:**

In our study, the age of patients ranged from 18 to 75 years. The mean age in this cohort was 41.75 years. The majority of cases (74%) were concentrated in the second, third, and fourth decades of life.

In our study, the highest number of cases (22 patients, 25.3%) belonged to the 21–30 years age group, indicating a higher prevalence of subacute intestinal obstruction (SAIO) and suspected abdominal tuberculosis in young adults. The second most affected age group was 41–50 years, comprising 17 patients (19.5%), followed by the 31–40 years age group with 15 patients (17.2%). The distribution suggests that both younger and middle-aged adults are significantly impacted. The mean age of the study population was 41.75 years, reflecting a broad demographic involvement in the disease spectrum.

In our study, the most commonly affected age group was 21–30 years, which aligns with findings from previously published studies by Naganoor et. al., Jain BK et. al., Maharshi et. al.[116–118] However, studies by Pillai et. al. and Jiang W. et. al. have reported a higher prevalence in individuals aged over 40 years, indicating possible regional or population-specific variations in disease patterns.[119,120]

**Gender Distribution:**

In our study, out of total 87 patients 41 (53%) were females and rest patients were males 46 (47%). It shows Male: Female ratio of roughly 1.12:1.

The gender distribution pattern in our study aligns with findings from several similar studies by Malik A et. al., Perea et. al. and Keena M. et. al., where males were slightly more affected than females. This suggests a consistent trend in the prevalence of the condition across different study populations.[121–123]

However, other studies, such as that of Arunima M et al. (2014), have reported a higher prevalence in females, with an occurrence rate of 61.5%.[124]

**Symptoms:**

The most common presenting symptom among patients in our study was abdominal pain(94%), followed by abdominal distension (82%), vomiting (73%), constipation and/or obstipation (68%), altered bowel habits (65%), anorexia (43%), fever (34%), and weight loss (19%).

In our study, the most common symptoms closely resembled those reported in previously published studies by Keena M. et. al. and Khan BF et. al., indicating a consistent clinical presentation of the condition.[123,125]

**Physical examination findings:**

In our study, abdominal tenderness was observed in nearly 100% of cases. Other clinical findings included abdominal distension in 85% of patients, guarding in 41%, reduced bowel sounds in 49%, and exaggerated bowel sounds in 26%. Less frequently observed signs were rigidity in 3% of cases and the presence of an abdominal mass in 1% of patients whereas in the Urabinahatti et. al.study, distension as the most common sign (75%), followed by tenderness (57.5%), ascites (42.5%), and a lump in the abdomen (17.5%)[126].

**Tuberculosis Contact History:**

In this study shows that 85.1% of patients had no known TB contact, while 14.9% had a positive contact history. This suggests that most cases may have resulted from unidentified exposures or endogenous reactivation.

In the study of Singh et. al. indicated that a significant proportion of abdominal tuberculosis patients lack a documented TB contact history. A review from India reported that only 5% of ATB patients had a prior TB history[127]. Similarly, a study

by Sanju et. al. in South India found that just 13.6% of TB patients had household TB contact, suggesting community transmission as a major factor[128]

**Known case of Tuberculosis:**

In this study shows that 97.7% of patients had no prior TB diagnosis, suggesting they were newly diagnosed or previously undetected cases. Only 2.3% had documented TB history, indicating a small fraction with prior treatment or recurrence.

Findings from previous studies indicate many abdominal tuberculosis (ATB) patients lack a recorded TB history. A UK study by Mamo JP et. al. found 4 out of 17 ATB patients had co-existing pulmonary TB[129]. A 10-year review at St George's Hospital by Nayagam et. al. reported 30.8% of ATB patients had chest X-ray abnormalities suggestive of past TB[130]

**Erythrocyte Sedimentation Rate (ESR):**

The ESR distribution among 87 patients is as follows:

0-15 mm/hr: 39.1% (Normal)

16-20 mm/hr: 28.7% (Mild Inflammation)

21-30 mm/hr: 10.3% (Moderate Inflammation)

>30 mm/hr: 21.8% (Significant Inflammation)

ESR is a non-specific marker of inflammation often elevated in Tuberculosis.

A study by Uzunkoy et. al. of 11 ATB patients reported an average ESR of 50 mm/hr, ranging from 30 to 125 mm/hr[131].

Another study by Indrasari et. al. found an ESR cut-off of 32.5 mm/hr had 81% sensitivity and 62% specificity in diagnosing intestinal tuberculosis[132].

**Montaux Test:**

In this study, 63.2% had a negative Mantoux test, indicating no significant TB exposure or possible immunosuppression, 27.6% tested positive, suggesting prior TB exposure or active infection, 9.2% had no available results.

In the context of abdominal tuberculosis, a study by Rana S et. al. reported a positive Mantoux test in 84.8% of patients. This higher positivity rate may reflect regional TB prevalence or differences in test administration and interpretation[133].

**Serum AFB:**

In my study, only 1.1% tested positive for serum AFB, 6.9% tested negative and 92% had no available results, indicating limited use of this test.

Serum AFB smears have low sensitivity for abdominal tuberculosis due to its paucibacillary nature. Studies by Tobin H. et. al. show that AFB smear positivity is rare in extrapulmonary TB, making it an unreliable diagnostic tool[134].

**Sputum AFB:**

In my study, 2.3% tested positive, confirming pulmonary tuberculosis (TB), 21.8% tested negative, showing no detectable mycobacteria and 75.9% had no available results, indicating the test was not performed or recorded.

In Rana S et. al. study, sputum AFB smears have low sensitivity (22%-80%), and a negative result does not rule out tuberculosis[135]. In abdominal tuberculosis (ATB), concurrent pulmonary TB is uncommon, making sputum AFB less useful.

**CBNAAT:**

In this study, out of 87 patients 1.2% tested positive for Cartridge-Based Nucleic Acid Amplification Test (CBNAAT), confirming Mycobacterium tuberculosis infection and 5.7% tested negative, indicating no detectable TB DNA in their samples and 93.1% lacked CBNAAT results, suggesting the test was not performed or documented for most patients.

In the study of Nishal N et. al., abdominal tuberculosis, CBNAAT's diagnostic performance varies. A study reported 88.88% sensitivity and 32.14% specificity, indicating high false-positive rates and suggesting CBNAAT is more suitable as a screening tool than a definitive diagnostic test in abdominal tuberculosis[136]

**TB-Gold:**

In this study, out of 87 patients 1.1% tested positive, indicating prior M. tuberculosis exposure, 0% tested negative, suggesting the test was rarely performed and 98.9% had no available results, reflecting limited utilization.

QuantiFERON-TB Gold (QFT-G) detects immune responses to TB antigens and is mainly used for latent TB diagnosis. Its role in active TB, especially ATB, is debated.

A study in Ethiopia by Niguse S et. al. found a 55.1% positivity rate, with 70.3% sensitivity and 49.5% specificity, indicating limited accuracy in active tuberculosis[137].

Study by Niguse S et. al. stated that in India, 92% of practitioners acknowledged QFT-G's role in LTBI, but only 59% used it due to high cost and inability to distinguish active from latent.[137]

**Chest X-Ray:**

A chest X-ray analysis of 87 patients revealed normal findings (49.4%) 43 patients showed no signs of tuberculosis or lung disease.

Prominent bronchovascular markings (52.8%) – 48 patients had markings suggestive of inflammation or chronic lung conditions.

Pleural effusion (12.8%) – 10 (11.49%) patients exhibited effusion, which can be linked to tuberculosis, infections, or malignancies.

No active/advanced tuberculosis signs (0%) – No nodular opacities, cavitary lesions, or lymphadenopathy were observed.

Another study by Tobin et. al. noted that chest radiography should be performed to evaluate patients for evidence of active and latent pulmonary tuberculosis, emphasizing its role in comprehensive tuberculosis assessment[134].

In a study by Kilic O et. al. of 35 children with abdominal tuberculosis, 31.4% showed active pulmonary tuberculosis on chest X-ray, suggesting that while some abdominal tuberculosis patients have concurrent pulmonary involvement, a majority may not exhibit active pulmonary tuberculosis findings[138].

**X-Ray Abdomen (Erect):**

In radiological assessment of 87 patients revealed key findings like multiple Air-Fluid Levels (98.9%) Observed in 86 patients, suggesting intestinal obstruction, commonly caused by tubercular strictures or adhesions. Abdominal tuberculosis relevance: Study by Debi et. al. highlight mechanical obstruction as a major complication due to fibrosis and cicatrization[63].

In the study of Debi et. al., Abdominal Distention (85.1%) present in 74 patients, often linked to bowel obstruction or ileus. Abdominal tuberculosis relevance: Distention is a frequent symptom in peritoneal TB, usually associated with ascites and lymphadenopathy[63].

Normal Findings (1.1%) in only 1 patient had a normal X-ray, indicating high prevalence of abnormalities.

Calcified Lymph Nodes (2.3%) seen in 2 patients, which may indicate prior TB infection. Abdominal tuberculosis relevance: Calcified lymph nodes are occasionally observed in chronic tuberculous lymphadenopathy[63].

No cases showed gas under the diaphragm, thumbprinting, or strictures, which are sometimes seen in chronic tubercular enteritis. Abdominal tuberculosis relevance: While classic TB radiological signs are not always present, clinical suspicion remains crucial.

**Ultrasound Findings:**

In our study of 87 patients, Dilated Bowel Loops (91.9%) A Strong Indicator of Intestinal Obstruction. 79 out of 87 patients had dilated bowel loops, a radiological hallmark of intestinal obstruction, frequently caused by tuberculous strictures, adhesions, or paralytic ileus. Previous studies suggests that 90% of intestinal TB cases present with features of partial or complete bowel obstruction, often requiring surgical intervention[63,108].

In the study of Chakaya et. al., Ascites (30.2%) 26 patients had free fluid in the peritoneal cavity, which may indicate tuberculous peritonitis, malignancy, or liver disease. Previous studies suggests that in endemic regions, up to 50% of peritoneal TB cases present with ascitic fluid, highlighting its diagnostic significance[139].

In the previous study of Sharma A et. al., Mesenteric Lymphadenopathy (25.6%), A Hallmark of tuberculosis Lymphadenitis 22 patients had enlarged mesenteric lymph nodes, one of the most frequent sonographic findings in abdominal tuberculosis. Previous research shows that mesenteric lymphadenopathy is detected in 40–60% of abdominal tuberculosis cases, making it a key diagnostic feature[87]

Bowel Wall Thickening (20.9%) 18 patients showed thickened bowel walls, commonly observed in tuberculous enteritis, Crohn's disease, or malignancies. Previous Studies by Ghoshal et al., 2021 shows in meta-analysis revealed that 20–35% of abdominal tuberculosis cases present with bowel wall thickening, supporting its diagnostic relevance[63].

Previous study by Pragalathan et. al. shows Omental Thickening (1.2%) A Rare but Significant Finding 1 patient had omental thickening, which can be associated with peritoneal tuberculosis, carcinomatosis, or chronic inflammatory conditions. tuberculosis peritonitis can lead to "omental caking," a feature often seen in malignancies and granulomatous infections[140].

Normal Findings (1.2%) Only 1 patient had a completely normal ultrasound, further reinforcing the high prevalence of abnormalities in the study group.

Absence of Certain Features like Thickened mesentery (often seen in chronic tuberculosis cases), Peritoneal thickening (indicative of peritoneal tuberculosis) and Pulled-up cecum or complex mass, sometimes seen in advanced tuberculous enteritis.

**CT-Scan Findings:**

CT scans are crucial in diagnosing abdominal tuberculosis. The analysis of 87 patients' CT findings highlights key features associated with tuberculosis:

Ascites (38.4%) Found in 33 patients, suggesting possible tuberculous peritonitis. Further analysis of ascitic fluid (ADA, CBNAAT, culture) is needed.

Mesenteric Lymphadenopathy (23.3%) 20 cases showed enlarged lymph nodes, a common tuberculosis feature, typically with central necrosis and peripheral rim enhancement.

Bowel Wall Thickening (24.4%) 21 patients exhibited thickening, often involving the ileum and cecum, which may lead to strictures. Differentiation from Crohn's disease is necessary.

Ileocecal Thickening (9.3%) Seen in 8 cases, this is a hallmark of abdominal tuberculosis, often causing fibrosis and obstruction.

Calcified Lymph Nodes (3.5%) Present in 3 patients, indicating prior, healed TB rather than active disease.

Peritoneal (2.3%) & Omental Thickening (1.2%) minimal involvement observed, though more common in advanced tuberculosis peritonitis.

Normal Findings (10.5%) – 9 patients had unremarkable scans, showing that normal CT does not rule out abdominal tuberculosis.

Unavailable Data (43%) – 37 cases lacked CT findings, highlighting the need for complete imaging.

Comparative analysis with previous studies peritoneal involvement: A study by Sinan T et. al., spanning 20 years reported peritoneal involvement in 77.5% of abdominal TB cases, with 55.2% presenting ascites, underscoring the significance of peritoneal manifestations in TB diagnosis[141].

Lymphadenopathy: The same study found lymphadenopathy in 46.9% of patients, highlighting its prevalence in abdominal tuberculosis.

Bowel Wall Thickening: Noted in 38% of cases, bowel wall thickening is a common CT finding in abdominal tuberculosis[141].

**Other Investigations:**

Other investigations, such as colonoscopy and barium meal studies, were not performed as they were deemed unnecessary based on clinical assessment and initial diagnostic findings.

Kedia et al. (2017): Found that colonoscopic biopsy in suspected intestinal TB had a sensitivity of 65% and specificity of 100% for caseating granulomas[90].

Mishra et al. (2021): Reported that 60% of intestinal TB cases had ileocecal involvement, with ulcerations and strictures being the most common findings[134].

Limsrivilai et al. (2016) – PCR improves diagnostic yield but is not routinely available[142].

Balasubramanian et al. (2018): Early-stage TB can have normal barium studies, leading to false-negative results[143].

**Clinical Diagnosis:**

This chart presents clinical diagnoses among 87 patients, with a strong indication of abdominal tuberculosis (TB) as a potential cause.

**Subacute Intestinal Obstruction (SAIO)** - 97.7% (85 patients)

- The overwhelming majority (85 out of 87 cases) were diagnosed with SAIO, indicating that partial bowel obstruction is the predominant clinical issue.
- Possible causes in this cohort:
  - Intestinal tuberculosis (most likely) due to TB-associated fibrosis, strictures, or adhesions.
  - Inflammatory processes (e.g., Crohn's disease, which mimics TB).
  - Malignancy (less likely based on the imaging findings).
- Findings correlate with:
  - X-ray Abdomen: 88.9% had multiple air-fluid levels, reinforcing the mechanical obstruction diagnosis.
  - CT-Scan & Ultrasound: High rates of bowel wall thickening, mesenteric lymphadenopathy, and ascites, supporting tuberculosis.

Bangladesh Study (2014)by Nashir et. al.: In a cohort of 100 patients with acute abdomen due to intestinal causes, 16% were diagnosed with intestinal tuberculosis[144].

Patiala Study (2020–2022) by Paras Kumar et. al.: Among 100 cases of intestinal obstruction, 13% were attributed to abdominal tuberculosis[145].

Eastern India Study (2021–2022)by Nashir et. al.: In a study of 30 patients with acute abdominal TB, 76.7% presented with acute intestinal obstruction[144]

**Mesenteric lymphadenopathy** is a hallmark of abdominal tuberculosis (TB), with 28.7% (25 out of 87) of patients in this cohort presenting with the condition. This finding aligns with prior studies by Sinan T et. al. where 23–46.9% of abdominal TB cases showed mesenteric lymph node enlargement on CT scans and ultrasound[141].

**Mass Per Abdomen** in Abdominal Tuberculosis (2.3%) A mass per abdomen in abdominal TB often arises due to tuberculous fibrosis, adhesions, or a conglomerate of inflamed lymph nodes, most commonly at the ileocecal region. This presentation is well-documented in TB-endemic regions.

Mumbai Study (2020) by Vagholkar et. al.: Among 50 cases of abdominal TB, 8% presented with an abdominal mass, often at the ileocecal junction[146].

South India Study (2018) by Singh A et. al.: Reported 7.6% of cases of abdominal TB presenting with an abdominal lump, most commonly due to fibrotic strictures or adhesions[127].

**Tubercular Peritonitis:** 2.3% (2 patients)

- Suggests infective peritonitis, possibly tuberculous peritonitis due to ascites (seen in 38.4% on CT-Scan).
- Needs further confirmation with ascitic fluid analysis (ADA, CBNAAT, and culture for TB).

Proportion Among Extrapulmonary TB Cases: In the previous study by Vaid et. al., Tubercular Peritonitis accounts for approximately 6.1% of all extrapulmonary TB cases[147].

**Perforation peritonitis:** In this study cohort, only 1.1% (1 patient) presented with perforation peritonitis.

A study from India by Kusmayadi et. al. reported an incidence of 4.9% among abdominal TB cases[148].

Another study by Vaid et. al. noted a range of 4% to 7.6%, with a mortality rate of up to 30%[147].

A review article by Kusmayadi et. al. indicated that tuberculosis-related perforations most commonly affect the ileocecal region due to caseous necrosis and ischemic changes[148].

**Intra-Op Findings:**

Out of the 87 patients, surgical intervention was performed on 2 individuals due to the necessity for surgical exploration and Intra-Op findings are follow:

- A significant majority, 97.7% of the cases, were classified as "Not performed," indicating that surgical intervention was not required.
- 2.3% (2 patients) were categorized as "Tubercular," suggesting that tuberculosis was the underlying pathology in those who required surgery.
- During surgery, 1 (1.1%) patient was found to have adhesions with mesenteric lymphadenitis, while another 1 (1.1%) patient had adhesions along with omental thickening.

Adhesions Present Adhesions are frequently observed in abdominal tuberculosis cases. A study in Tanzania by Chalya et. al. reported bands and adhesions in 58.5% of patients undergoing surgery for abdominal tuberculosis[149].

Omental Thickening Present Absent Omental involvement, including thickening, is common in abdominal TB. The same Tanzanian study by Chalya et. al. noted peritoneal involvement in 41.4% of cases, which often manifests as omental thickening or "caking."[149]

Mesenteric lymphadenopathy is a hallmark of abdominal TB. The Tanzanian study by Barot et. al. found enlarged mesenteric lymph nodes with adherent small bowel in 4.7% of patients. Another study reported mesenteric lymphadenitis in 16% of cases[150]

Small bowel perforation, though less common, is a severe complication of abdominal TB. The Tanzanian study by Barot et. al. reported bowel perforations in 15.1% of cases. Another study noted bowel perforation in 6% of patients. The absence of perforation in these patients indicates a less aggressive disease course[150]

Cecal Thickening: Cecal involvement is often associated with ileocecal tuberculosis. The Central India study highlighted the ileocecal region as a common site of involvement. The absence of cecal thickening in these patients further underscores the variability in abdominal tuberculosis presentations.

Pulled-Up Cecum can be indicative of chronic inflammation and fibrosis in abdominal tuberculosis. A study by Barot et. al.reported this finding in 6% of cases. Its absence in these patients may suggest a different disease progression or stage[150].

**Management:**

In this study, treatment response of 87 patients, with 69 (79.3%) managed conservatively without Anti tubercular therapy, 16 (18.4%) receiving empirical Anti tubercular therapy based on clinical suspicion, and 2 (2.3%) treated with Anti tubercular therapy as confirmed tuberculosis cases.

**Conservative Management** in Abdominal tuberculosis: Several studies by Pandey Y et. al. have highlighted the efficacy of conservative management in patients with subacute intestinal obstruction (SAIO) due to abdominal tuberculosis[151].

A prospective study by Pandey Y et. al. involving 134 patients with intestinal obstruction, abdominal TB accounted for 29% of cases. Among all patients, 60% responded to conservative management, which included bowel rest, nasogastric decompression, intravenous fluids, and ATT when TB was diagnosed[151]

In a hospital-based study by Darbari et. al. of 50 cases of abdominal tuberculosis out of 50 patients, 24 (48%) were treated conservatively with a four-drug anti tubercular regimen. This group included patients with tuberculous peritonitis, subacute intestinal obstruction, right iliac fossa lumps, and colonic pathology[152].

Kalbhande & Chaudhary (2024)-India, Case Report: A 17-year-old male with acute intestinal obstruction due to tuberculosis, conservative treatment involving antitubercular therapy, short-course steroids, and dietary modifications[153].

**Empirical Antitubercular Therapy (ATT):** Sharma et al. (2017), retrospective study on abdominal tb study population 120 patients with suspected abdominal tuberculosis, 25% of patients were started on empirical att due to strong clinical and radiological suspicion. 70% of these patients improved clinically within 4–6 weeks, avoiding surgical intervention[154].

In a study of "Osman Abdullahi et. al." Approximately 50% of patients in our study were diagnosed clinically and treated empirically without laboratory confirmation, with 70% of these cases having a negative sputum smear or GeneXpert test[155]

In the study by Webb E et. al. it was stated that if microbiological confirmation is not achieved but clinical suspicion for tuberculosis remains high, patients are classified as 'probable TB' and are commenced on anti-tubercular treatment accordingly[156].

In the previous study by Pratap et. al., When empiric TB therapy is pursued, end-of-treatment endoscopy may be helpful in differentiating TB disease as significant or complete mucosal healing is reported in more than 75% of cases[157].

In the study by S. Waikar et al., it is noted that treatment is often initiated despite a negative sputum microscopy result, as nearly 50% of all newly notified tuberculosis cases annually in low- and middle-income countries are sputum-negative[158].

In the study by Melissa Davidsen et al., it is highlighted that clinical presentation alone is insufficient for reliably diagnosing extrapulmonary tuberculosis (EPTB), and reliance on empirical anti-TB treatment can result in overtreatment. The authors suggest that a combination of simple clinical parameters may serve as a practical tool to assess treatment response and enhance patient management, particularly in low-resource settings. However, they emphasize the need for larger and more comprehensive studies to further evaluate and validate these parameters.[159]

**Antitubercular therapy for Extrapulomonary Tuberculosis:**[111]

**Standardized Treatment Regimens (as per NTEP):**

**Treatment Phases:**

**IntensivePhase**

**Duration:** 8weeks (56doses)

**Medications:** Isoniazid(H), Rifampicin(R), Pyrazinamide(Z), and Ethambutol(E)

**Administration:** Daily, weight-band-based dosing, under direct observation.

**Continuation Phase**

**Duration:** 16 weeks (112 doses)

**Medications:** Isoniazid (H), Rifampicin (R), and Ethambutol (E)

Note: Pyrazinamide (Z) is discontinued during this phase.

Administration: Daily dosing continues.

**Special Considerations for Adult Abdominal TB**

- Treatment duration may be extended in cases of inadequate clinical response.
- Surgical intervention should be considered for complications such as intestinal obstruction (due to strictures) or bowel perforation.
- Endoscopic dilatation may be used for accessible strictures.
- Referral for biliary drainage is advised in cases of jaundice due to biliary or pancreatic TB-related obstruction.

# *CONCLUSION*

# CONCLUSION

The present study provides critical insights into the clinical, radiological, and demographic profile of patients presenting with subacute intestinal obstruction, highlighting the significant role of abdominal tuberculosis as an underlying etiology. The findings emphasize that Subacute Intestinal Obstruction predominantly affects young to middle-aged adults, with a slightly higher incidence among males. Abdominal pain, distension, vomiting, and altered bowel habits emerged as the most common symptoms, while diagnostic imaging—particularly ultrasound and CT scans—played a pivotal role in identifying key features such as bowel wall thickening, mesenteric lymphadenopathy, and ascites.

Notably, the majority of patients lacked a prior history of tuberculosis or known contact with TB cases, underscoring the often-silent transmission and latent nature of abdominal Tuberculosis. Diagnostic tools such as ESR, chest X-ray, and CBNAAT had varied utility, reaffirming the challenges of confirming abdominal Tuberculosis microbiologically. Nevertheless, a strong clinical suspicion, supported by imaging and conservative management, remains the cornerstone of treatment in most cases.

Empirical antitubercular therapy demonstrated favorable outcomes, particularly in the absence of surgical complications, reinforcing its role in resource-limited settings where confirmatory diagnostics may be inaccessible. Surgical intervention was reserved for a small subset of patients with complications, such as adhesions or omental thickening.

In conclusion, abdominal tuberculosis should remain a high index of suspicion in patients with Subacute Intestinal Obstruction, especially in Tuberculosis-endemic regions. Early recognition, judicious use of imaging, and timely initiation of empirical therapy can significantly improve patient outcomes and reduce the need for surgical intervention.

# *SUMMARY*

# SUMMARY

This observational study was conducted at Santosh Medical College & Hospital, Ghaziabad, over a period of 18 months, with the primary objective of evaluating the prevalence and clinical profile of abdominal tuberculosis (TB) in patients presenting with subacute intestinal obstruction (SAIO). A total of 87 patients aged between 18 and 75 years were included, with a slight male predominance and the majority belonging to the 21–30-year age group.

Clinically, abdominal pain, distension, vomiting, and altered bowel habits were the most commonly reported symptoms. Physical examination consistently revealed abdominal tenderness, while imaging studies such as ultrasound and CT scan frequently identified findings characteristic of abdominal TB, including bowel wall thickening, mesenteric lymphadenopathy, ascites, and dilated bowel loops.

Despite the low microbiological confirmation rates through tests such as CBNAAT, sputum AFB, and TB-Gold, a high clinical suspicion guided diagnosis and management. A significant proportion of patients were managed conservatively, with 18.4% receiving empirical antitubercular therapy and 2.3% treated as confirmed TB cases. Surgical intervention was required in only a small number of patients, primarily for complications such as adhesions and omental thickening.

The study highlights the diagnostic challenges of abdominal tuberculosis, particularly in resource-limited settings, and reinforces the importance of clinical acumen supported by imaging for timely diagnosis and management. It also underlines the need for increased availability of confirmatory diagnostics and further research to standardize treatment approaches.

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# *ANNEXURES*

# PROFORMA

**SECTION-A**

**Patient Information:**

- NAME:
- AGE:
- GENDER:
- ADDRESS:
- CONTACT NUMBER:
- MEDICAL RECORD NUMBER:
- HOPI:
- PAST HISTORY:
- FAMILY HISTORY:
- PERSONAL HISTORY:

**GENERAL EXAMINATION:**

- MENTAL STATE-
- BP-
- PR-
- RR-
- SpO2-
- P/I/C/C/L/E-

**CVS EXAMINATION:**

**RESPIRATORY EXAMINATION:**

**PER ABDOMEN EXAMINATION:**

**CNS EXAMINATION:**

## Clinical Presentation:

- Presenting Complaints:
- Duration of Symptoms:
- History of Tuberculosis or Contact with Tuberculosis Cases:

**Diagnostic Findings:**

**1. Imaging:**

- X-ray Chest:
- USG Whole Abdomen:
- CT Abdomen:

**2. Laboratory Tests:**

- CBC:
- ESR
- Mantoux Test:
- AFB Smear and Culture:
- CBNAAT(Sputum/Fluid):
- ADA:
- Other relevant tests:

**SECTION-B**

**Treatment Regimen:**

**1. Drug Therapy:**

- Anti-Tuberculosis drugs used and their dosages.
- Treatment duration and patient compliance.

**2. Surgical Interventions:**

- Surgical procedures, if applicable.
- Any complications or post-operative outcomes.

**Psychosocial Impact:**

**1. Psychological Assessment**

- Outcome Measures:

**2. Remission and Improvement:**

- Document patient response to treatment.
- Record resolution of subacute intestinal obstruction and related symptoms.

**Follow-up:**

- Frequency of Follow-up Visits:
- Duration of Follow-up:
- Status at Follow-up (Improved, Stable, Deteriorated):

**संतोष मेडिकल कॉलेज एवं अस्पताल (गाजियाबाद)**

**<u>सहमति पत्र (सूचित)</u>**

मैं _____ बेटा/ बेटी/ पत्नी_____निवासी _____ घोषणा करता हूं कि डॉ ._____, ने मुझे मेरी भाषा में अपने अध्ययन "**Comprehensive Analysis Of "Abdominal Tuberculosis In Subacute Intestinal Obstruction""** के उद्देश्य के बारे में, और अध्ययन के दौरान अपनाई जाने वाली विभिन्न प्रयोगशाला जांच के बारे में सूचित कर दिया है। मुझे अध्ययनकी अवधि और उसके दौरान अपनाए जाने वाले निर्देश भी मेरी भाषा मे समझा दिए गए हैं| मैं उपरोक्त अध्ययन में बिना किसी दबाव के दाखिला ले रहा हूं और पूर्ण सहमति दे रहा हूं | सन्तोष अस्पताल, गाजियाबाद में अपने आगे के उपचार पर बिना प्रतिकूल प्रभाव डाले इस अध्ययन से और प्रयोगशाला जांच की प्रकृति से मैं जब चाहूँ बाहर जाने के अपने अधिकार को सुरक्षित रख रहा हूं |

रोगी / रोगी के रिश्तेदार के हस्ताक्षर डॉक्टर के हस्ताक्षर

नाम

दिनांक:

मेरी उपस्थिति में मरीज ने पूरी तरह से डाकटर के बताए गए अध्ययन और निर्देशों को समझने के बादअपनी स्वतंत्र इच्छा से ऊपर के फार्म पर हस्ताक्षर किए हैं ।

हस्ताक्षर: नाम: डॉ0 संतोष कुमार साहनी

पदनाम: पीजी

शल्य चिकित्स विभाग

## INFORMED CONSENT

I _____ Son/Daughter/Wife of _____ resident of _____hereby declare that I give my full, free and voluntary informed consent in the thesis - "**Comprehensive Analysis Of "Abdominal Tuberculosis In Subacute Intestinal Obstruction"".**

I, Dr._____ has informed me to my full satisfaction, in the language I understand, about the purpose, nature of study and various laboratory investigations for the study to be carried out. I have been informed about the duration of the study and instructions to be followed during the study period.

I give full consent for being enrolled in the above study and I reserve my rights to withdraw from this study, whenever I wish without prejudice of my right to undergo further treatment at Santosh Hospital, Ghaziabad U.P.

Patient's/ Patient's relative's signature Or thumb impression

Doctors signature

Name:

Date:

We have witnessed that the patient signed the above form in the presence of his free will after fully understanding its content.

Signature of Witness

Name

Signature of Investigator

Name: Dr. Santosh Kr. Sahani

Designation: PG Department of General Surgery

Contact No.- 7007669108

# SANTOSH MEDICAL COLLEGE & HOSPITAL

**Details of Patient Information Sheet**

**Human Subject Research Proposal**

**1)** Identifying Data

Name of Researcher: Dr. Santosh Kumar Sahani

Department: Department of General Surgery

Title of Project**: Comprehensive Analysis Of "Abdominal Tuberculosis In Subacute Intestinal Obstruction"**

**2)** Description of Human Subjects Safeguards and Rights:

**A)** Possible psychological or physical risk or discomfort, involved in research

Yes □ NO □ (if no, skip item B)

If Yes, answer the following

Why necessary?

1. To have the common disease
2. Specificity and sensitivity of the treatment

**B)** Make sure the following questions are answered in your research proposal on collection of Data:

1) When will it take place?

August 2023- February 2025

2) What length of time needed for complete examination of the patient?

Approx 1 hour.

3) What period of time needed?

Approx 1.5 year.

4) Which specific place within institution?

Department of Surgery.

5) How much population required including number of subjects?

87

6) Name of instrument to be used for data collection?

USG findings, CT Scan, Laboratory Tests.

7) Methodology to be used (write details)?

A detailed history of all patients will be taken and a thorough clinical examination will be done. All patients will be analyzed in various aspects like USG findings, CT Scan, Laboratory Tests.

The analyzed data will be correlated with other series in literature and discussed. A master chart dealing with all aspects will be designed and presented. A proforma will be used for the study purpose.

**C)** Will Subjects be given research results if they so request?

Yes □ No □

# PLAGIARISM CHECK CERTIFICATE

## Dr. Santosh Kumar Sahani

### COMPREHENSIVE ANALYSIS OF "ABDOMINAL TUBERCULOSIS IN SUBACUTE INTESTINAL OBSTRUCTION"

Santosh University, Ghaziabad

### Document Details

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# ETHICAL COMMITTEE CLEARANCE

SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

F. No. SU/R/2023/2489[42] Dated: 26.09.2023

Subject: Grant of Ethical Clearance for **Thesis Protocol** Topic **"COMPREHENSIVE ANALYSIS OF " ABDOMINAL TUBERCULOSIS IN SUBACUTE INTESTINAL OBSTRUCTION "",** submitted by **Dr. SANTOSH KUMAR SAHANI,** MD/MS student of Batch 2022-2023, Department of **GENERAL SURGERY.**

*****

With reference to his/her request for grant of Ethical Clearance for the Thesis Protocol entitled **"COMPREHENSIVE ANALYSIS OF " ABDOMINAL TUBERCULOSIS IN SUBACUTE INTESTINAL OBSTRUCTION "", Dr. SANTOSH KUMAR SAHANI** is informed that the **Thesis Protocol** submitted by him/her was considered by the **Screening Committee** of the Santosh Medical College & Hospital in its meetings held on 17.07.2023 to 28.07.2023. The recommendations of the **Screening Committee** were considered in detail by the **Institutional Ethics Committee** in its meeting held on **23.09.2023** and the same was **approved** by the **Ethics Committee.**

He /She is informed accordingly for further necessary action.

[Dr. NARESH SHARMA]
REGISTRAR

SANTOSH DEEMED TO BE UNIVERSITY REGISTRAR GHAZIABAD, U.P.

**Dr. SANTOSH KUMAR SAHANI**
MD/MS student of batch 2022-2023
Department of GENERAL SURGERY
Email: santoshsahni55@gmail.com

**Copy to:**

1. The Vice Chancellor
2. The Dean, SMC&H
3. The Dean – Academics
4. The Dean – Research
5. The Director - IQAC
6. Dr. Shalabh Gupta (Guide)
7. HOD of GENERAL SURGERY

# DISSERTATION CERTIFICATE

# *MASTER CHART*

# MASTER CHART

| S.No. | UHID | Age(years) | Gender | HR | RR | SBP | DBP | SpO2 | Temperature | Co-morbidities | Known case of Tuberculosis | Known case of Pulmo. Tuberculosis | Tuberculosis Contact History | Presentation | Per abdomen Findings | Haemoglobin | ESR | Serum AFB | Sputum AFB | Montaux | CBNAAT | TB-Gold | Chest X-Ray | X-Ray Abdomen (Erect) | Ultrasound | CT-Scan | Colonoscopy | Barium Study | Clinical diagnosis | Operative Findings | Surgical cause | Responded to |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17388099 | 20 | Female | 87 | 18 | 112 | 68 | 98 | 97.9°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Fever, Altered bowel habit | Tenderness, Reduced bowel sounds | 13.2 | 7 | Not available | Negative | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Mesenteric Lymphnode | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 2 | 17357842 | 40 | Female | 68 | 22 | 116 | 64 | 100 | 98.4°F | Thyroid Disorder | No | No | No | Pain abdomen, Altered bowel habit, Reduction/Loss of appetite | Tenderness | 12.8 | 8 | Not available | Negative | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops | | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 3 | 17542759 | 18 | Female | 88 | 20 | 112 | 78 | 96 | 99.6°F | None | No | No | Yes | Pain abdomen, Nausea/Vomiting, Fever, Altered bowel habit, Significant weight Loss | Tenderness, Distension, Exaggerated bowel sounds | 11.7 | 9 | Not available | Negative | Positive | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Enlarged mesenteric lymph nodes, Calcified lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 4 | 17517195 | 45 | Male | 88 | 17 | 114 | 88 | 100 | 99.1°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension | 12.2 | 12 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 5 | 17305047 | 40 | Male | 79 | 24 | 114 | 68 | 100 | 98.0°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 10.1 | 9 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Bowel wall thickening | Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 6 | 17264291 | 31 | Male | 93 | 18 | 120 | 74 | 100 | 98.6°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Exaggerated bowel sounds | 12.4 | 19 | Not available | Negative | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 7 | 17471355 | 21 | Male | 88 | 22 | 108 | 66 | 96 | 99.6°F | None | No | No | No | Pain abdomen, Fever, Cough | Tenderness, Distension, Exaggerated bowel sounds | 14.8 | 12 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Normal Findings | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 8 | 17499565 | 24 | Female | 93 | 18 | 94 | 74 | 98 | 99.1°F | None | No | No | Yes | Pain abdomen, Nausea/Vomiting, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Reduced bowel sounds | 13.7 | 75 | Not available | Negative | Positive | Negative | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Mesenteric Lymphnode, Bowel wall thickening | Enlarged mesenteric lymph nodes, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 9 | 17523656 | 34 | Female | 97 | 18 | 88 | 72 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 11.9 | 6 | Not available | Negative | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 10 | 17516062 | 73 | Male | 68 | 24 | 108 | 84 | 96 | 98.6°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension | 14.4 | 22 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 11 | 17368803 | 46 | Female | 72 | 20 | 96 | 78 | 98 | 98.6°F | Thyroid Disorder | No | No | No | Pain abdomen, Fever, Altered bowel habit | Tenderness, Distension, Exaggerated bowel sounds | 8.6 | 15 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Enlarged mesenteric lymph nodes, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 12 | 17315067 | 50 | Male | 78 | 18 | 142 | 88 | 100 | 98.2°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 7.9 | 55 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 13 | 17311752 | 28 | Female | 63 | 18 | 98 | 64 | 96 | 98.8°F | None | Yes | Yes | Yes | Pain abdomen, Nausea/Vomiting, Fever, Reduction/Loss of appetite, Significant weight Loss | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 14 | 35 | Positive | Positive | Positive | Positive | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level,Calcified lymph nodes | Mesenteric Lymphnode, Ascites, Omental thickening | Ascites, Omental thickening, Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Antitubercular Therapy (Confirmed case) |
| 14 | 17550193 | 29 | Female | 89 | 20 | 112 | 72 | 98 | 99.1°F | None | No | No | Yes | Pain abdomen, Nausea/Vomiting, Fever, Altered bowel habit, Significant weight Loss | Tenderness, Distension, Guarding, Reduced bowel sounds | 9.9 | 25 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Mesenteric Lymphnode, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 15 | 17328058 | 50 | Male | 82 | 22 | 114 | 88 | 100 | 98.0°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Guarding, Exaggerated bowel sounds | 11.3 | 8 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 16 | 17330455 | 34 | Male | 114 | 18 | 120 | 78 | 98 | 98.6°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Guarding, Reduced bowel sounds | 13.6 | 18 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Bowel wall thickening, Ascites | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 17 | 17335341 | 32 | Male | 68 | 24 | 86 | 66 | 100 | 97.9°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Guarding | 13.3 | 10 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 18 | 17342357 | 73 | Male | 118 | 22 | 144 | 70 | 100 | 99.6°F | Hypertension, Diabetes | No | No | No | Pain abdomen, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss, Cough | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 9.6 | 22 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening, Ascites | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 19 | 17457663 | 45 | Male | 74 | 18 | 116 | 78 | 96 | 99.4°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness | 14.3 | 18 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Other Bowel wall thickening | Not available | Not available | Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 20 | 17448286 | 63 | Male | 64 | 20 | 138 | 74 | 96 | 97.9°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Altered bowel habit | Tenderness, Guarding | 11.8 | 12 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 21 | 17270396 | 70 | Female | 116 | 24 | 156 | 78 | 96 | 98.4°F | Hypertension, Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit | Tenderness, Guarding | 10.1 | 20 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 22 | 17276033 | 20 | Female | 85 | 18 | 112 | 68 | 98 | 98.8°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Exaggerated bowel sounds | 13.7 | 18 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 23 | 17308742 | 24 | Female | 88 | 22 | 110 | 76 | 100 | 99.8°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding | 13.2 | 24 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 24 | 17260922 | 20 | Female | 126 | 20 | 112 | 72 | 98 | 99.7°F | None | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 10.9 | 33 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode, Bowel wall thickening | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 25 | 17260227 | 43 | Female | 126 | 24 | 114 | 88 | 96 | 99.9°F | Diabetes | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss | Tenderness, Distension, Guarding, Reduced bowel sounds | 10.2 | 42 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode, Bowel wall thickening | Ascites, Peritoneal thickening, Enlarged mesenteric lymph nodes, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Peritonitis, Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 26 | 17260752 | 60 | Female | 92 | 22 | 108 | 82 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 9.1 | 15 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 27 | 17501491 | 29 | Female | 74 | 18 | 116 | 82 | 98 | 98.2°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 13.3 | 39 | Negative | Not available | Positive | Negative | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management (Without ATT) |
| 28 | 17261412 | 34 | Male | 62 | 18 | 108 | 78 | 96 | 98.7°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness | 12.5 | 9 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 29 | 17263846 | 84 | Male | 124 | 18 | 142 | 72 | 98 | 99.8°F | Hypertension, Diabetes | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 8.9 | 28 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 30 | 17273000 | 50 | Male | 88 | 24 | 110 | 92 | 100 | 98.7°F | Diabetes | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Significant weight Loss | Tenderness, Distension | 12.7 | 16 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Normal Findings | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 31 | 17270082 | 60 | Male | 116 | 20 | 138 | 86 | 100 | 98.2°F | Hypertension | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Rigidity, Guarding | 14 | 40 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening, Ascites | Ascites, Peritoneal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Peritonitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 32 | 17277381 | 21 | Female | 96 | 16 | 84 | 76 | 96 | 98.3°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 10.3 | 42 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management |
| 33 | 17278609 | 35 | Male | 88 | 18 | 114 | 64 | 96 | 98.5°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Cough | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.2 | 7 | Not available | Not available | Negative | Not available | Not available | Normal Findings, Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 34 | 17275049 | 50 | Male | 100 | 18 | 120 | 74 | 100 | 98.9°F | Diabetes | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Cough | Tenderness, Distension, Exaggerated bowel sounds | 9.9 | 12 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 35 | 17506236 | 61 | Female | 96 | 18 | 106 | 72 | 96 | 98.2°F | None | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Altered bowel habit | Tenderness, Distension | 10.3 | 15 | Negative | Negative | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 36 | 17247757 | 53 | Male | 74 | 20 | 102 | 82 | 96 | 98.6°F | Diabetes | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Guarding, Reduced bowel sounds | 13.3 | 38 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Ascites, Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 37 | 17250162 | 26 | Male | 92 | 20 | 106 | 72 | 96 | 97.9°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Significant weight Loss | Tenderness, Distension, Rigidity, Guarding, Reduced bowel sounds | 10.9 | 42 | Not available | Not available | Positive | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode, Bowel wall thickening | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |

# MASTER CHART

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 17253017 | 27 | Male | 73 | 18 | 86 | 64 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 14.1 | 18 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 39 | 17257224 | 60 | Female | 61 | 22 | 102 | 82 | 100 | 98.9°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Cough | Tenderness, Distension, Reduced bowel sounds | 10.8 | 9 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 40 | 17258143 | 32 | Female | 77 | 18 | 114 | 68 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Exaggerated bowel sounds | 13.4 | 10 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 41 | 17259298 | 30 | Male | 97 | 20 | 108 | 66 | 96 | 98.6°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 11.1 | 12 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 42 | 17259932 | 54 | Female | 58 | 22 | 154 | 96 | 100 | 99.1°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Guarding, Reduced bowel sounds | 14.1 | 14 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 43 | 17504082 | 57 | Female | 86 | 18 | 114 | 76 | 96 | 99.7°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 14.8 | 18 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 44 | 17288242 | 27 | Male | 86 | 20 | 118 | 78 | 100 | 98.4°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 10.9 | 8 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 45 | 17369822 | 21 | Male | 118 | 18 | 112 | 74 | 100 | 101.3°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Reduced bowel sounds | 11.3 | 10 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 46 | 17478269 | 22 | Female | 74 | 18 | 98 | 76 | 96 | 101.6°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Cough | Tenderness, Distension, Guarding, Reduced bowel sounds | 13.5 | 11 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 47 | 17501450 | 72 | Male | 122 | 24 | 126 | 88 | 96 | 102.1°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 9.6 | 15 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 48 | 17538347 | 50 | Female | 68 | 22 | 114 | 78 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Guarding, Reduced bowel sounds | 14.8 | 12 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |
| 49 | 17393976 | 56 | Male | 68 | 18 | 112 | 92 | 96 | 98.0°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Cough | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.6 | 18 | Not available | Not available | Negative | | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 50 | 17502689 | 65 | Male | 76 | 18 | 120 | 82 | 100 | 98.4°F | Diabetes | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 11.3 | 19 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 51 | 174922760 | 55 | Male | 78 | 20 | 128 | 94 | 100 | 100.7°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 10.7 | 36 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level, Calcified lymph nodes | Dilated Bowel loops, Mesenteric Lymphnode, Bowel wall thickening, Ascites | Ascites, Enlarged mesenteric lymph nodes, Other Bowel wall thickening, Calcified lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management (Without ATT) |
| 52 | 17428232 | 48 | Female | 88 | 22 | 116 | 88 | 98 | 98.0°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Significant weight Loss | Tenderness, Distension | 13.6 | 18 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 53 | 17527999 | 22 | Male | 81 | 18 | 116 | 64 | 100 | 101.8°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever,Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss, Cough | Tenderness, Distension, Rigidity, Guarding, Reduced bowel sounds | 13.9 | 32 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode, Bowel wall thickening | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Perforation peritonitis, Mesenteric Lymphadenitis | Adhesions, Mesenteric Lymph node enlarged | Tubercular | Empirical Antitubercular Therapy |
| 54 | 17257721 | 30 | Male | 77 | 16 | 88 | 68 | 96 | 97.7°F | None | Yes | Yes | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss, Cough | Tenderness, Distension, Guarding, Reduced bowel sounds | 14.1 | 30 | Negative | Negative | Positive | Negative | Not available | Normal Findings, Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode, Ascites | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Mesenteric Lymphadenitis | Not applicable | Not applicable | Antitubercular Therapy (Confirmed case) |
| 55 | 17257702 | 24 | Female | 91 | 20 | 134 | 77 | 96 | 98.9°F | None | No | No | No | Pain abdomen, Obstipation | Tenderness, Distension, Reduced bowel sounds | 10.3 | 34 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mass per abdomen | Adhesions, Omental thickening | Tubercular | Empirical Antitubercular Therapy |
| 56 | 17257362 | 32 | Female | 73 | 22 | 124 | 78 | 98 | 98.0°F | None | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Altered bowel habit, Significant weight Loss | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.5 | 36 | Negative | Negative | Positive | Negative | Not available | Prominent bronchovascular markings, Pleural effusion | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mass per abdomen | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 57 | 17257362 | 32 | Male | 87 | 18 | 138 | 72 | 96 | 98.6°F | None | No | No | No | Pain abdomen, Obstipation, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss | Tenderness, Mass | 8.9 | 25 | Negative | Negative | Not available | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Bowel wall thickening | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening, Calcified lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mass per abdomen, Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 58 | 17456631 | 60 | Male | 78 | 20 | 112 | 76 | 98 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite, Significant weight Loss, Cough | Tenderness, Distension, Exaggerated bowel sounds | 12.7 | 45 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 59 | 17456624 | 22 | Male | 112 | 18 | 116 | 80 | 100 | 98.6°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Exaggerated bowel sounds | 14 | 22 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 60 | 17518327 | 59 | Female | 118 | 22 | 112 | 90 | 96 | 99.6°F | Diabetes | No | No | No | Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Exaggerated bowel sounds | 10.3 | 25 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 61 | 17516082 | 42 | Female | 84 | 16 | 120 | 92 | 100 | 98.0°F | None | No | No | No | Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Reduced bowel sounds | 9.9 | 20 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 62 | 17428214 | 64 | Male | 78 | 20 | 128 | 98 | 98 | 99.1°F | Hypertension | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Significant weight Loss | Tenderness, Distension | 12.4 | 10 | Not available | Not available | Negative | Normal Findings | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 63 | 17514868 | 44 | Male | 86 | 20 | 110 | 84 | 96 | 98.8°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension | 10.9 | 8 | Negative | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 64 | 17501475 | 60 | Male | 98 | 18 | 142 | 80 | 98 | 99.1°F | Hypertension | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 14.1 | 42 | Not available | Negative | Positive | Negative | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Bowel wall thickening, Ascites | Ascites, Enlarged mesenteric lymph nodes, Ileocecal thickening, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 65 | 17511924 | 35 | Female | 92 | 18 | 100 | 92 | 100 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension | 10.8 | 20 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 66 | 17273852 | 45 | Female | 80 | 18 | 144 | 86 | 96 | 99.3°F | Hypertenssion, Thyroid Disorder | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.6 | 15 | Not available | Not available | Positive | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 67 | 17502589 | 29 | Female | 72 | 22 | 104 | 78 | 98 | 97.9°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Significant weight Loss, Cough | Tenderness, Distension, Exaggerated bowel sounds | 11.1 | 5 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management (Without ATT) |
| 68 | 17513878 | 20 | Male | 76 | 17 | 104 | 80 | 100 | 99.6°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension | 14.1 | 10 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 69 | 17502559 | 72 | Male | 88 | 16 | 104 | 72 | 98 | 99.4°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.6 | 15 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 70 | 17512830 | 18 | Male | 78 | 24 | 104 | 80 | 100 | 97.9°F | None | No | No | No | Pain abdomen, Obstipation, Abdominal Distension | Tenderness, Distension | 10.9 | 20 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 71 | 17504078 | 44 | Female | 68 | 20 | 118 | 74 | 96 | 98.8°F | None | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Significant weight Loss | Tenderness, Distension, Guarding, Reduced bowel sounds | 13.5 | 30 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes, Other Bowel wall thickening | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Empirical Antitubercular Therapy |
| 72 | 17512827 | 41 | Female | 84 | 18 | 100 | 70 | 96 | 99.8°F | Diabetes | No | No | No | Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Exaggerated bowel sounds | 9.6 | 16 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 73 | 17250701 | 45 | Female | 110 | 20 | 108 | 68 | 100 | 98.0°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 14.4 | 6 | Not available | Not available | Not available | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management |

# MASTER CHART

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| 74 | 17379985 | 31 | Male | 60 | 22 | 108 | 80 | 100 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension | 11.3 | 16 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 75 | 17504093 | 57 | Male | 78 | 17 | 118 | 82 | 98 | 98.7°F | Hypertension, Diabetes | No | No | Yes | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite, Cough | Tenderness, Distension, Guarding, Reduced bowel sounds | 12.6 | 15 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management (Without ATT) |
| 76 | 17532621 | 73 | Female | 92 | 16 | 110 | 84 | 96 | 99.8°F | Hypertension | No | No | No | Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Reduced bowel sounds | 13.9 | 11 | Not available | Negative | Not available | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 77 | 17505177 | 29 | Male | 64 | 24 | 98 | 74 | 96 | 98.7°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Reduced bowel sounds | 14.1 | 10 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 78 | 17530318 | 28 | Female | 90 | 20 | 118 | 76 | 98 | 98.3°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Guarding | 14.4 | 22 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 79 | 17507364 | 57 | Female | 86 | 18 | 120 | 84 | 100 | 98.5°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Exaggerated bowel sounds | 13.3 | 19 | Not available | Not available | Positive | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 80 | 17401676 | 26 | Male | 66 | 18 | 114 | 88 | 100 | 98.9°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Exaggerated bowel sounds | 10.9 | 20 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 81 | 17529423 | 33 | Male | 118 | 20 | 102 | 72 | 96 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Altered bowel habit | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 14.1 | 15 | Not available | Negative | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Mesenteric Lymphnode | Ascites, Enlarged mesenteric lymph nodes | Not available | Not available | Subacute Intestinal Obstruction (SAIO), Mesenteric Lymphadenitis | Not applicable | Not applicable | Conservative management (Without ATT) |
| 82 | 17391732 | 51 | Female | 70 | 22 | 102 | 64 | 96 | 98.6°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 10.8 | 14 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 83 | 17391736 | 26 | Female | 78 | 17 | 112 | 68 | 100 | 97.9°F | None | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Fever, Abdominal Distension, Reduction/Loss of appetite | Tenderness, Distension, Guarding, Exaggerated bowel sounds | 13.4 | 12 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 84 | 17396088 | 22 | Female | 80 | 16 | 112 | 88 | 100 | 98.0°F | None | No | No | No | Pain abdomen, Obstipation, Abdominal Distension, Significant weight Loss, Cough | Tenderness, Distension, Reduced bowel sounds | 11.1 | 9 | Not available | Not available | Positive | Not available | Not available | Prominent bronchovascular markings | Multiple Air-Fluid Level | Dilated Bowel loops | Normal Findings | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 85 | 17393988 | 39 | Female | 88 | 24 | 110 | 76 | 96 | 98.9°F | Thyroid Disorder | No | No | No | Pain abdomen, Obstipation, Nausea/Vomiting, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 14.1 | 7 | Not available | Not available | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops, Ascites | Ascites | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 86 | 17513916 | 66 | Male | 64 | 20 | 110 | 88 | 96 | 98.6°F | None | No | No | No | Obstipation, Nausea/Vomiting, Abdominal Distension | Tenderness, Distension, Exaggerated bowel sounds | 13.4 | 19 | Not available | Negative | Negative | Not available | Not available | Prominent bronchovascular markings | Distention, Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |
| 87 | 17504093 | 42 | Male | 110 | 20 | 128 | 88 | 98 | 99.9°F | None | No | No | No | Pain abdomen, Nausea/Vomiting, Abdominal Distension, Altered bowel habit, Reduction/Loss of appetite | Tenderness, Distension, Reduced bowel sounds | 10.7 | 25 | Not available | Not available | Negative | Not available | Not available | Normal Findings | Multiple Air-Fluid Level | Dilated Bowel loops | Not available | Not available | Not available | Subacute Intestinal Obstruction (SAIO) | Not applicable | Not applicable | Conservative management (Without ATT) |